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THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

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SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE AND FACTORY,

510 to 534 WEST 23d STREET, NEW YORK.

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A WEEKLY JOURNAL OF

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New Annunciator and Help Call.

The combined annunciator and bell, illustrated in the REVIEW, was recently introduced by the New Haven Clock Company. It will occupy the space of a 6-inch skeleton bell and has an annunciator attachment. The annunciator is placed in a nickel-plated case, with dial on the outside, as shown. The hand points to the number or name of the room as desired in hotel or residence. This is a novel improvement and will come into extensive use in places where from one to six drop annunciators are needed.

The factory help call is also manufactured by this company, and is becoming a popular call in factories. The apparatus is operated by placing the pointer on the employé's name you may wish to call and turn the rubber key at the base; the small bells throughout the factory will then strike the number of strokes allotted to this particular person, and he will understand that he is wanted at the office, and so with all the other names of employés on the dial.

Turn the Babbling Brooks into Electricity and Motive Power.

The following appeared in the *Transcript*, Boston, recently:

Why should Maine, New Hampshire and Vermont bewail their inability to compete with the natural gas fields of Pittsburgh and the West? Let them look about them for a moment and notice the vast "isolated plants" of water-power which is unfortunately localized outside of the different villages and towns, and for that reason has not as yet been put to any active use, and is left to waste itself, its only benefit being its pleasant music, which is borne to the ear of those who may happen to wander in its vicinity. Electricity can now be used to put this power in direct communication with the adjoining villages, towns and cities, and by the aid of this useful servant the various manufactories and industries can be furnished with power as at low a cost as that furnished by the subterranean storage tanks of Pittsburgh. Why do not the inhabitants of these places pause to think before expending vast sums of money to bring coal from a distant State, under a heavy expense, to their factories, when the wherewithal to do the same labor is running by them within easy reach, and they are wasting what an all-wise Providence has put forth as a labor-saving system for their special benefit. Even the household might be benefited by the distribution of this economical power, while the hard-working farmer might adapt much simple machinery to its use and relieve him of many arduous labors he now has to perform, using his individual muscle to such an extent as to bring him to an early loss of his bodily powers, together with those unwelcome hours of despondency over his inability to do the amount of work which he could boast of doing in his younger days. If he only ask the electricians to distribute the power at an economical cost, Yankee invention and ingenuity will do the rest, and our farmers will be flooded with labor-saving machines by enterprising agents, who will vie with each other in the cheapness, durability and economy of their wares, which, applied to the power referred to, will bring to the farmer what is enjoyed by the West.

It is said that electricity is in its infancy. Let us first bring up this infant at home and get a few of the benefits of its rapid growth before sending it out to benefit the outside world.

FRANK RIDLON.

Boston.

—— A party of Boston capitalists, owners of the street car lines in that city, and Mr. Frank Ridlon, as electrical expert, were recent visitors in Richmond, Va., looking at the electric road in operation there.

—— The Thomson-Houston International Company is sending to South America an incandescent lighting plant to be placed in a mining establishment in the heart of the Andes, 14,700 feet above the sea level.

FIG. 2.—ANNUNCIATOR AND BELL.

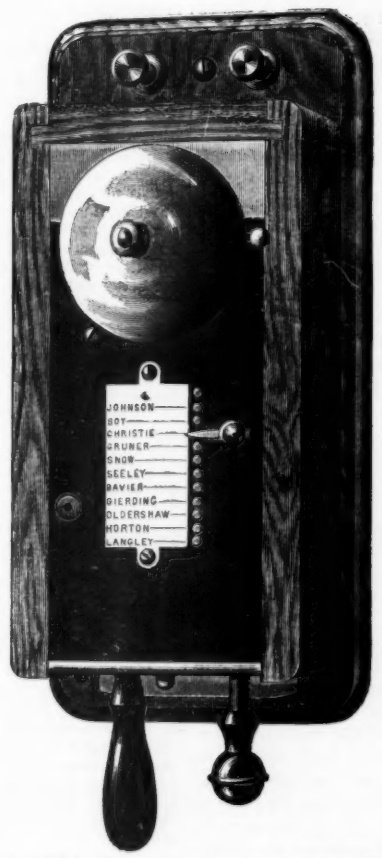


FIG. 1.—THE NEW HAVEN CLOCK CO.'S NEW HELP CALL.

—— The annual meeting of the Penn Electric Light Company, of New Jersey, was held in Camden, last week, when the following Board of Directors was elected: B. K. Jamison, Thomas Dolan, W. D. Marks, James McManes, D. H. Lane, Henry Clay, Walter S. Smith, R. H. C. Hill, M. B. Taylor.

About Lightning Rods.

TO THE EDITOR OF ELECTRICAL REVIEW:

Sometime ago your valuable paper had an article concerning lightning rods which commanded general attention and went the rounds in mostly all the newspapers in the United States and elsewhere. The article I refer to went to show the utter uselessness of lightning rods as generally put up and that they were often more dangerous than beneficial. Whether or not you have proved the lightning rod worthless, you have set people thinking and in time good may come of the agitation on this very important matter, and may arouse some bright electrician to give us some valuable protection for our houses. The man who will do this will reap a valuable reward. T. I. S.

New York, July 16.

Electric Signals for Army Scouts.

The scouts or signal officers carry in their knapsacks six small incandescent lights of the different primary colors. These are connected by a very fine wire with a small battery in the knapsack. Attached to the small globes that inclose the lights is a very small oval electric motor, operated by an independent battery. When one scout wishes to communicate with another he sends one globe high in the air and then turns on the electric fluid that illuminates it. By the use of the different colored globes and by combinations a conversation of any length can be carried on at night at long distances.

The Burton Electric Heater.

FIRST PAPER—DIFFICULTIES—THE TEST—A COLLAPSE.

TO THE EDITOR OF ELECTRICAL REVIEW:

The idea of an electric heater first occurred to the inventor some time during the early part of the year 1863. At this time every coal yard in the city of Richmond had been "seized" by the Confederate Government, and to obtain fuel for private consumption was not only difficult, but often led to serious inconvenience if not actual suffering. One morning, after a fruitless search for coal, the inventor had returned to his office on Franklin street, second door from Eighth street, south side, and in glancing over a morning newspaper his eye was attracted by the following paragraph: "It is said that the *Hotel Dieu*, in Paris, is heated by electricity." This "set him to thinking," as the phrase goes, and at the close of the war he instituted a series of experiments which resulted in his obtaining a patent for an "Improvement in Electric Heaters," under the date of March 23d, 1869; and in September of the same year a full description of the invention was published in *Van Nostrand's Engineering Magazine*, through the kindly interest taken in it by the editor, Mr. G. W. Plympton. It will thus be seen that so far from being a "sudden inspiration," the present Burton electric heater is the result of at least *twenty-five years* of thought, experiment, and, it may be added, of bitter disappointment, and of mental and physical suffering. At this time, experiments were made entirely with the current from the ordinary telegraph battery, as the patent antedated the present dynamo electric machine by at least ten years. The difficulty then was not in the construction or principles of the invention, but in the absence of the apparatus to produce the necessary current. Bearing on this point, the following letter is introduced, the original of which is in the possession of the inventor:

RICHMOND, VA., Jan'y 21st, 1869.

Dr. W. LEIGH BURTON, *Present:*

Dear Sir:—In reply to your note concerning your "Electric Heating Apparatus," I have to say that the idea of applying electricity for the warming of apartments or other domestic purposes appears to me to possess merit enough to justify experiment and entitle it to special investigation.

The application of electricity to such a purpose would be new, and in demonstrating it you would probably discover another invention to be necessary, viz. that of proper instruments, for I am not aware of any instrument at present that will satisfactorily fulfill the conditions of your problem.

Respectfully, etc.,

M. F. MAURY.

The interest of Commodore Maury in the heater did not end here. He gave the inventor the address of Mr. Wm. Ladd, which was "Beake street, Regent street, London," and a correspondence ensued with this gentleman as to the feasibility of his constructing a "magneto electric machine" to be used for heating purposes. The reply of Mr. Ladd not being encouraging, the matter was dropped.

Before the patent had been issued, certain parties who had manifested considerable interest in the heater came together and agreed on a plan to test the feasibility of the invention. There were seven of these, and the amount of expenditure was to be limited to

$300 each. Each was to have one-tenth interest in the invention, while the remaining three shares were supposed to be held by the inventor. But one of these having been donated to Mr. R. M. J. Paynter (since deceased) for facilities afforded in making tests with telegraph batteries, and another having been assigned to a gentleman in New York for pecuniary assistance rendered at a critical moment, the inventor was placed on the same footing with the rest in being the possessor of *one-tenth interest!* It should be mentioned, also, that the duty was imposed on the inventor of supervising all tests and experiments, *with no understanding whatever as to his being compensated for loss of time from his legitimate business.*

This organization having been effected, a correspondence was opened with Mr. Matthew F. Maury, Jr., then a student in the School of Mines, in London, England. He was authorized to offer a ten guinea fee to Professor John Tyndall, lecturer in the Royal Institution, in order to obtain from him an expression of opinion of the practical value of the heater; and, moreover, was empowered to hold a personal interview with Mr. Wilde, in Manchester, the maker of the magneto electric machine bearing his name, with the view of ascertaining from him the possibility of his constructing a machine to serve our purpose. Professor Tyndall flatly refused to even look at a model of the heater or listen to an explanation of its principles, assigning as a reason for his conduct that he had a dread of being mixed up in lawsuits in case any should grow out of any infringement of patents. Nor was Mr. Maury's mission to Manchester any more successful. Mr. Wilde said he *could* make such a machine as was required, but its cost and size would preclude its economical adoption.

At this period in the history of the heater, the city of Richmond was a portion of "military district No. 1," said district being under the command of General Schofield of the United States Army. General Schofield had had the principles of the heater explained to him, and such was the lively interest he manifested in it that he recommended that Prof. Bartlett, his father in-law, of the West Point Military Academy, should be consulted as to its merits. It was accordingly arranged that the inventor should undertake this trip, and having been provided with a kind letter from General Schofield to Professor Bartlett, he, in due time, reached West Point. During the interview which occurred, Professor Bartlett was as kind and affable as a thorough gentleman and soldier could be; but beyond recommending the make of a particular form of magnet machine which had been used in blasting on the Hudson near the Academy, no substantial results followed. On his return homeward, the inventor having stopped at Washington, he had the opportunity of testing a model of the heater with the large galvanic battery then used for lighting the gas jets in the dome of the Capitol building. Strangely enough, too, the maker of the magnet machine mentioned by Professor Bartlett was in the city and present at this test, but he had gone out of business and knew of no manufacturer who could furnish the machine wanted. There was also present at this test the patent attorney, who was there authorized to apply for the patent which he afterwards obtained. From the time the patent was issued no move was made in developing the heater until the winter of 1871, when the inventor learned that there was in the possession of the Government at Washington a "Wilde" magneto electric machine of great power, which had been constructed with the view of furnishing illumination for lighthouses, and he at once commenced a correspondence with the proper authorities with the view of making a test with this instrument. About the same time, a correspondence had also occurred between him and the late Professor Jos. Henry, then in charge of the Smithsonian Institute, in which the aid of Professor Henry was invoked to obtain temporary use of this machine. In reply, Professor Henry stated it might save the inventor the expense of a trip to Washington to submit an explanation of the invention to him; but this proposition he having respectfully declined, the extraordinary behavior of this party afterwards could be accounted for on no other grounds than that he had taken serious offence at this refusal.

Finally, after months of waiting, permission was obtained for the use of the Wilde machine, which was ascertained to be in possession of the Engineer Department, and was stored in one of the basement rooms of the "Winder" building. The next step being to obtain the proper credentials, the inventor secured a letter from Gov. Gilbert C. Walker to the Secretary of War, and also others from different parties to prominent officials in Washington, and in due time left for the scene of the coming tests.

Having arrived at Washington, the inventor concluded to call on Professor Henry, and, being provided with a model, he found this official in his luxurious office, with his feet resting on lamb's wool mats, in the Smithsonian Institute. Having made himself and his mission known, Professor Henry at once proceeded to work himself into a towering passion.

"You have an electric heater, have you?" contemptuously asked the professor.

That was what he claimed, meekly replied the inventor.

"What can you do with it, sir? Can you boil water, sir? Can you cook with it?"

The inventor replied that he really did not know, that he then was on the eve of making certain tests to ascertain its possibilities.

"Nonsense, sir! It's humbug, sir! You should never have been allowed a patent, sir!" And just then Professor Henry foamed and blustered so in his rage that his lower artificial teeth were ejected from his mouth, but as this had probably occurred before, he dexterously caught them in his handkerchief and, turning his head to one side, adroitly replaced them.

It was ascertained on reaching the Winder building that Lieutenant King had charge of the Wilde machine, and that the tests were to be made under his supervision. This officer from the start formed a most unfavorable opinion of the electric heater. "You are throwing away your time," said he to the inventor, "and no matter what may be the heating power of the current you are about to make a test of, you will never succeed in heating economically by electricity."

In spite of these discouragements, it was determined that the test should be made, and 3 o'clock having been agreed on as the time, General Humphries, of the Engineer Corps, General Meyers, of the Signal Service, and a number of Government officials were promptly on hand, *including Professor Henry.*

It is proper to say here that earlier in the day the heating power—of which there had been a doubt—of the Wilde machine had been satisfactorily demonstrated. Eighteen feet of No. 18 iron wire had been heated to *redness*, and the ten heaters connected in series were warmed up to a degree sufficient to cause the wooden casings which contained the heating coil *to smoke.* In order that the coming public test should be accessible to interested parties, the heaters were placed in a room on the first floor and connected with the generator in the basement, driven by the steam engine used for ventilating the building, by means of copper ribbons.

To any fair minded person the test which then occurred would have been highly encouraging, and, indeed, the newspaper representatives present so telegraphed and wrote to their several journals. But here Professor Henry again acted with the most questionable taste. He denounced the heater in the most vehement terms, and jamming his hat down over his eyes rushed from the room in a rage. This conduct not only disconcerted the inventor, but so discouraged the spectators that *they left before a fair test of the heaters could be possibly made.* Taking into consideration that General Marshall Lefferts, electrician of the Western Union Telegraph Company, had stated to one of the parties interested in the heater that *no heat whatever could be obtained from the current of the magnet machine,* this test was encouraging to the extent of proving that General Lefferts was wrong. But his opinion had been such a blow to the heater that with the conclusion of this test the interested parties declined to spend another dollar in its development, although they had not reached the limit agreed on. Then followed a long rest for the electric heater, for it was *ten years* after the events narrated above that the "dynamo" was invented and the electric light introduced in our principal cities.

That financial disaster should occur to the inventor, after the collapse of the electric heating project, was inevitable. It was a case of "win all or lose all," and as no provision had been made by the parties interested with him for compensating him for his loss of time, and as they had *refused* to indemnify him when urged to do so, the auctioneer's flag at the door of his residence told plainer than words the loss of a once lucrative practice, and that a crisis had been reached.

"What is Electricity?"

EXTRACT FROM ADDRESS BY PROF. A. E. DOLBEAR.

These material benefits that flow from the utilization of electricity to supply our wants, and that marks an epoch in our history, are not the only benefits we have received. The work of the world must be done, and the more of it we can make the inorganic energies do for us to supply our pressing needs, the more leisure we shall have to devote to higher social and intellectual interests. In his essay on "The Praise of Knowledge," Bacon asks, "Is there any such happiness as for a man's mind to be raised above the confusion of things, where he may have the prospect of the order of Nature?" "Shall we not as well discern the riches of Nature's warehouse as the benefit of her shops?" "Shall we not thereby be able to produce worthy effects, and to endow the life of man with infinite commodities?" He then declares that "all the disputation of the learned never brought to light one effect of Nature before unknown," and that "knowledge itself is more beautiful than any apparel of words that can be put upon it," and that the "sovereignty of man lieth hid in knowledge." These good things have come to us as the fruits of knowledge, and in turn they have been the seed of knowledge. Others of the so-called forces of Nature are limited as to the phenomena which they can produce. Gravitation can only pull. Chemism arranges molecules. Heat tends to separate molecules, and so may be made to do work, but electricity is Nature's jack-of-all-trades. It not only does errands, but can attract and repel, make heat and light and magnets. Can cause molecules to combine and can separate them, it can write and talk and paint, sharpen a needle and turn a crank, roar like a volcano, and both cure and kill you. Of course, an agency having such various functions excites our curiosity and challenges our intelligence for an explanation. Who has not asked the question, "What is electricity?" To-day we are better able to answer this question than any one forty years ago was able to answer the similar one, "What is heat?"

Through the labors of Faraday, Mayer, Joule, Helmholtz and some others, we have come into possession of a body of generalizations, the evidence for which, though not demonstrable, is overwhelming, because it is cumulative. This is what is known as the conservation of energy. Briefly this may be stated to be, first, that physical energy is a product of two factors, matter and motion; and second, that the energy of the universe is a constant quantity. The latter proposition comes from our chemical experience that whatever changes a mass of matter may undergo it is never annihilated and never increased in quantity, and therefore all the various phenomena exhibited by matter are due to the various kinds of molecular motion which it may have. Even the so-called properties of matter are explainable as due to it. There have been theories in the past that electricity is a fluid, or two fluids supposed to be imponderable, but nowadays no one thinks that it is a fluid in any sense. Consider the conditions under which electricity in any or all of the ways in which it may be made to appear. In a battery it is proportional to the chemical reactions, that is the molecular changes.

As the matter is not changed in quantity, it follows that the changes must be changes of motion. In a thermopile the motion provided is that vibratory kind called heat. In a common electrical machine, so long as the crank is turned the electricity is generated at the expense of the motion, not of the material of the machine. In like manner in a dynamo and in every other case. As Rowland has said, "It begins in matter and ends in matter, and must be a property of matter." But electricity never appears except when motion of some sort is spent upon two different kinds of matter, or upon matter in two different physical states. In the battery there must be two elements, in the thermopile two metals, in the dynamo there is a difference in molecular stress in different parts of the magnetic field, and so on, from which it follows that if there was but one kind of matter in the universe there could be no electricity; and, second, that the phenomenon called electrification is due to the molecules being thrown into abnormal positions and the propagation from molecule to molecule by contact of this same abnormal position constitutes what is called a current of electricity. Heated matter loses its temperature by a process called radiation, a kind of motion in the ether. Radiant motions take place in straight lines, and unless there be molecules in their path they will continue on forever unless there be a boundary to the universe. The ether changes neither the direction or the character of the rays. An electrified mass of matter depends almost altogether upon the character of other bodies in the vicinity. Some can absorb these rays, or lines of force as they are more generally called, and thereby they become electrified, and this process is called electrifying by induction as distinguished from electrifying by conduction or contact. The velocity of propagation of this action in the ether is found to be the same as for light, showing that a disturbance in the ether travels with a velocity that does not depend upon its origin but upon the property of the ether to transmit motion. Again, when heated matter loses its temperature by radiation, the vibratory molecular motion is changed into an undulatory motion in the ether, a transformation in the kind of motion as well as a transfer to another medium, and it is not correct to speak of heat rays. The ether is never heated, no matter how much energy they may be in it. Similarly the inductive lines or rays from an electrified body represent transferred electrical motion, and such effects of electricity ought not to be confounded with electricity. One difficulty that has been felt by many about the fluid hypothesis or any other has been on account of the dual character known as positive and negative. That difficulty may be made to disappear by considering the character of the motion to be of the nature of a rotation. Imagine an endless rope as representing an electric circuit. At any point in it let it be twisted by the hands. It will be seen to have a right-handed twist traveling in one direction and a left-handed twist in the opposite direction, and each through the whole length of the rope, both co-existing without interference, yet nothing but simple rotation can be seen at any particular point. Call the right-handed rotation positive and the left-handed negative and you have both an analogical phenomenon and the nomenclature. There is then no necessity for assuming either a fluid or anything more mysterious about electricity than there is about heat. These dynamical principles are not only a distinct gain to science, but they are of such a character as to give delight to the thoughtful man as a part of Nature's warehouse of which Bacon speaks. They give to one the prospect of the order of Nature and add to the sovereignty of man.

Lightning Rod Sharpers Working a New Scheme.

The lightning rod swindlers are working a new scheme and one calculated to catch a fellow. The farmer is first called upon by a pair of slick-tongued chaps who inform him they are sent out by insurance people to examine lightning rods; that the losses by reason of defective lightning protectors have become so frequent and heavy that the companies, in self-defence, are compelled to look after the matter and remedy the defects so far as it lies in their power. An electric battery is produced, the farmer coupled on to the handles, the lightning rod being in circuit, and the current not being turned on he feels no shock. Then they produce a sample of lightning rod which they can furnish the farmer, and to show him how perfectly the electricity is changed to their rod, and the machine being very heavily charged this time, the farmer gets a shock that is almost a knock down argument. Of course, the bait is swallowed, and the victim signs the contract, and in a day or two along comes the second division of the gang, who put up the rod. About this time the farmer receives another and harder shock by being presented with a bill largely in excess of his expectations. No use kicking, for his contract stares him in the face, and he can do nothing but make the best of a bad bargain.

An Electric Ferryboat.

Mr. Edison intends to utilize the pond of water which now separates his laboratory from his new phonograph factory. He will build a small ferryboat to be run by electricity, and it will be run back and forth from the laboratory to the factory every half hour. This will interfere with the small boy of Orange who has enjoyed bathing facilities in this pond all Summer. But science must not be retarded.

A New Feed Water Heater.

The mechanical construction of this heater is simple; but it might well be called a compound, automatic heater.

This invention, manufactured by the Hussey Re-Heater and Steam Plant Improvement Company, is used for heating water for steam boilers or for other purposes, and relates particularly to that class of such apparatus that is designed to be located in a flue or similar part leading from the furnace of a steam boiler.

It is well understood that with feed water heating apparatus, as heretofore used in the flue, the variation in temperature between the inner and outer surfaces of the water heating parts produces sweating or condensation of moisture on the outer surfaces, and such outer surfaces being exposed to the varying heat of the gases and the waste products of combustion in the furnace flue, a rapid oxidation and encrustation takes place thereon, and the parts are rapidly destroyed. Usually such heating surfaces consist of coils or banks of pipes, this form of heater being usually necessary in order to secure the greatest heating surface in the smallest space, it being desirable to not greatly enlarge the flue; and the rapid eating away of such pipes and consequent liability to explosion, together with the cost and inconvenience of replacement of the parts, is a fault of the common form of heaters, that it is of the greatest importance to obviate.

A further objection to the common form of water heaters is that, by reason of the fluctuating temperature of the contained water and its irregular motion through the pipes, deposits of lime, mud and like impurities in the water are deposited within the pipes and act to clog them, and thereby seriously interfere with the working capacity of the heater.

The compound automatic water heater is so constructed, and its various parts are so arranged, that the water will be preliminarily heated before it passes into the bank of pipes where it is raised to its highest temperature, thereby preventing the fluctuations of temperature in such pipes that produce exterior deterioration of their furnaces, and also so that the motion of the water through such pipes will be continuous and practically constant, thereby preventing deposits in these pipes, and consequent clogging thereof.

The accompanying cut shows a section of the flue and contained water heating apparatus.

Referring to the cut in detail, *A* represents a battery or series of steam boilers, and *B* is the smoke flue which is common to the boilers, and conducts the products of combustion to the chimney. This flue is of sufficient size to contain the apparatus located therein without interfering with the draught necessary to the furnaces; and it may be the flue leading from a single or any number of boilers, or it may be any suitable part of any similar passage for conducting away the gases and products of combustion from the furnaces of one or more steam boilers.

C is the receiving tank, or preliminary heater, of the water heating apparatus. It consists of a cylindrical shell, *C*, the lower half of which is pierced from end to end by open heating pipes or tubes, *D*. This receiver is connected by pipe, *E*, with the supply tank, *F*, which is a closed structure provided with a float, *G*, connected to the steam pump, *H*, in such a manner that as the water becomes lowered in the tank, the pump will be caused to operate and supply the tank through the feed pipe, *I*.

J is the water-heating coil, or bank of pipes. The bottom courses of this coil are connected with the bottom of the receiving tank, or preliminary heater, and the arrangement of successive courses is such that the circulation of the water is upwardly from course to course.

K is the supply reservoir; that is, the reservoir from which the heated water is taken to charge the boilers. This reservoir consists of a cylindrical shell, *K*, the heads of which are pierced with open heating tubes, *L*, reaching from one head to the other, and extending from the bottom to the top of the reservoir. From the top of the reservoir rises the outlet pipe, *M*, to which is joined the supply pipe, *N*, running to a feed pump, *O*, by which the heated water is pumped into the boilers, or wherever desired. The outlet pipe, *M*, continues over as a vapor pipe, *P*, to and enters the supply tank, *F*.

Q is a blow-out pipe for this reservoir, and *R* is a blow out pipe for the receiving tank, *C*.

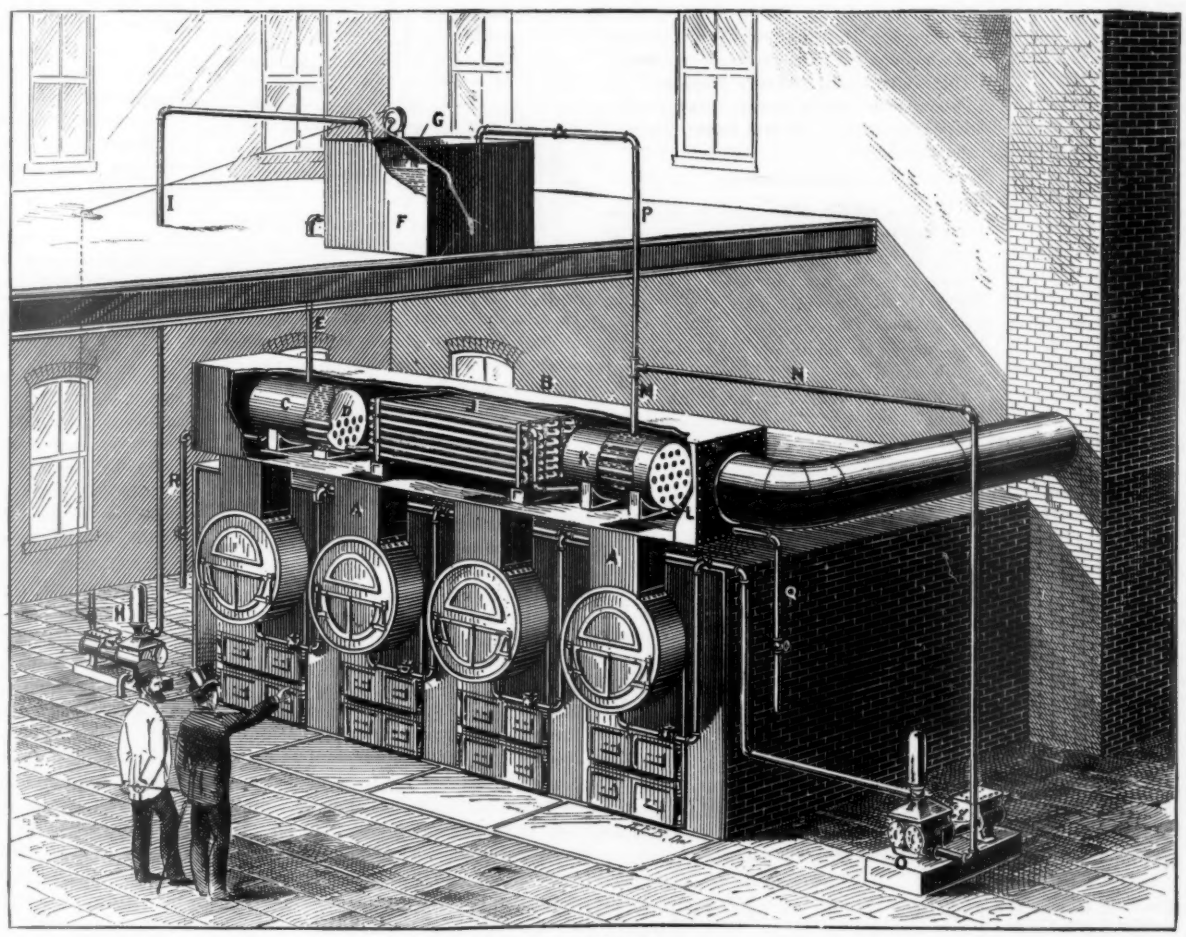
These structures constitute the essential part of the water heating apparatus. They are built in size and working capacity to strictly correspond with the work required of them and the available heat of the flue that contains them. This balancing of these parts, each to the others, and all to the boilers that they are to serve, is important to the economical and effective working of the apparatus, which is a matter of engineering knowledge. One of the important features of construction is that the receiving tank is of such size that the water will not, in ordinary practice, be drawn through it so rapidly as to enter the heating coils at a temperature varying from a uniform or practically uniform temperature.

The operation is as follows: It is first to be understood that the heated gases of the flue are circulating around and through the receiving tank, the reservoir, and the heating coils, and thereby raising the temperature of their contents. As the water comes in at the top of the receiving tank it meets the heated water already there, and, mingling with the same and passing around and between the tubes of this receiver, is brought to substantially the same temperature as this appartus before it sinks to the bottom thereof. From the receiving tank the water passes to the heating coil in which, by reason of the large heating surface, it is brought to the desired final temperature, that is, to very nearly boiling point.

From the heating coil the water passes into the bottom of the supply reservoir, where its temperature is maintained, or increased, if desired, by circulating around the tubes of this reservoir and mingling with its contents, and then ascends to the outlet pipe, from which it is drawn and pumped into the boilers in a condition at or just below the point of vaporization.

By this apparatus the following advantages are secured: the water, as it is delivered from the supply tank, or other source of supply, is first heated in the receiving tank, *C*, and brought to such a heat that when it is subsequently further heated in the pipe coils, the sweating of these coils is obviated, and hence the effects of exterior oxidation and encrustation are obviated, and these coils may be used for a much greater length of time than is possible in the common form of such apparatus, with the corresponding saving in cost of repairs, cost of cleaning mechanism for such pipes, and the time and trouble in the care of the same.

It may be thought possible that the reveiving tank will be somewhat subjected to the effects of exterior sweating and consequent deterioration, but it is to be noted that this structure is constructed with special reference to being readily repaired. That is, the tubes of this tank, being the parts where these effects would occur, if at all, are very easily taken out and quickly replaced as compared with the difficulty and time necessary to replace a ruptured or worn out pipe of a complicated heating coil. If, however, this tank be properly constructed and related to the heating coil and working demands of the boilers, the necessity for repair of the same may be practically obviated, so far as concerns that due to the effects of sweating and exterior encrustations.



THE HUSSEY RE-HEATER.

This tank and the heating coils form an operable combination, that is, a great improvement upon any form of apparatus that is at the present time used for a similar purpose. That is, the supply pipe to the boilers may lead to the boilers directly from the heating coil; but it is preferred to use the supply reservoir to still further assist in keeping the heating coil at sufficiently high or uniform temperature to protect it against deteriorating effects explained. Thus, the reservoir may serve to hold a quantity of heated water greater than is likely to be demanded by the boilers at any one time, and thereby wholly obviate or reduce even the slight undesirable effects upon the coil that might, but for the presence of this reservoir, be due to a sudden demand by the boilers. This reservoir also serves to ensure a more constant current or flow of water through the coil, than would be the case were the coil used without it; and this will lead to prolong the life of the coil, as thereby any encrusting of or deposits upon the inner surfaces of the coils is prevented. So, too, the reservoir acts to collect mud and lime and other impurities carried over by the water and not deposited in the receiving tank.

As a further assistance to the regular action of the apparatus, the supply pipe from this reservoir is continued into a vapor pipe that passes back to the supply tank. This vapor pipe serves to conduct the vapor that may be formed over to the supply tank where it is utilized to raise the temperature of the cold water. Excessive pressure is also obviated by the use of this pipe, the pressure in the apparatus being thereby kept uniformly at the desired point, which obviously will be that represented by the head or pressure of the source of supply.

A water supply tank provided with automatic connections for filling the same is shown as the form of supply that is preferable; but any similarly governed source of water supply will serve the same purpose though not so well. That is, water can be taken directly from public water mains or from a pump, though with this apparatus the vapor pipe could not be so readily employed to partly heat the water before it enters the receiving tank.

In cases where condensing engines are used, and it is desirable to take the water from a hot well, the supply tank would of course be dispensed with, as also the feed pump, *O*, and the water pumped directly from the hot well through the heating apparatus, *C*, *J* and *K*, into the boilers.

A Bureau of Electrical Testing.

As there is no provision in this country for the accurate comparison of electrical standards and apparatus, it has been decided to provide means for such measurements at the Johns Hopkins University. The importance of such provision for the comparison of standards has been for some time recognized. Such representative bodies as the American Association for the Advancement of Science, and the National Electrical Conference, held in 1884 at Philadelphia, have discussed the possibiltity of a bureau of standards and have favored its establishment. It is not probable that the government will take any steps in the matter, at least for the present, and as time goes on, the need becomes more pressing. Some laboratory is needed where instruments can be compared with standards of undoubted correctness, by accurate methods and careful observers, under uniform and determinate conditions. These requirements are filled by the standards and apparatus in the possession of the university, and by the facilities and experience that the laboratory offers. The work will be directed by Dr. Henry A. Rowland, and the comparisons will be made by Dr. G. A. Liebig, who has been appointed assistant in electricity.—*Baltimore Sun.*

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

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NEW YORK, JULY 28, 1888.

CONTENTS.

	PAGE.
New Annunciator and Help Call	1
Turn the Babbling Brooks into Electricity and Motive Power	1
About Lightning Rods	1
Electric Signals for Army Scouts	1
The Burton Electric Heater	1
What is Electricity?	2
Lightning Rod Sharpers Working a New Scheme	2
An Electric Ferryboat	2
A New Feed Water Heater	3
A Bureau of Electrical Testing	3
Electric Horse and Cable Cars	4
Infringing Telephoners Made Unhappy	4
Important Decisions in England	4
Our Chicago Letter	4
Our Alabama Letter	5
An Important Announcement	5
Electric Motor Notes	5
New Corporations	5
Telephonic News	6
A New Automatic Register	6
Our Kansas City Letter	6
More Information Touching Underground Matters and Alternating Currents, Brought out at Meeting of Board of Electrical Control	7, 8, 9, 10
Magnetism in Watches	10
Appliances for Storage Batteries	10
Electric Light News	10
Electrical Patents	11

Meanwhile, remember that August 29 will soon be here.

The next meeting of the National Telephone Exchange Association will be held in this city at the Hotel Brunswick commencing Tuesday, September 4th, 1888.

The Senate Interstate Commerce Committee has reported favorably to the Senate the interstate telegraph bill, and placing telegraph companies under the jurisdiction of Interstate Commerce Commmission.

A despatch to the Carson City (Nev.) *Appeal* says: "The *Appeal* has it from reliable authority that John Mackay has disposed of his cable to Jay Gould for $11,000,000. Negotiations have been pending for some time. Mackay originally asked $12,000,000, but Gould refused the cable at these figures and finally offered $11,000,000, which was accepted."

A recent decision before the examiner of interferences in the Patent Office, gives to Mr. Stephen D. Field priority of invention of a modern type of dynamo electric motor. This is after nearly 10 years' litigation in the Patent Office, and is a result that may prove very interesting in electric motor circles in the near future.

We give considerable space to the discussion before the Board of Electrical Control, and our electric light readers will find in it much of value and interest. The young man, Harold Brown, self-styled an "electrical engineer," is probably convinced that he has opened his mouth and put his foot in it. He should carefully read the papers presented by Messrs. Peck, Slattery, and Smith, and we think he will receive very valuable information to a gentleman of his evident conceit.

ELECTRIC, HORSE AND CABLE CARS.

The Fourth Avenue street car company of New York is about to commence running its cars by means of electrical storage batteries carried under the cars. The company appointed experts to make calculations as to the ratio of cost, gain and loss in the three methods of propelling street cars. The following are the results announced:

	Electric.	Horse.	Cable.
Cost of cars	1	0.54	0.81
Motive power	1	1.45	1.06
Construction of roadway.	1	0.53	2.09
Depreciation and repairs.	1	1.47	2.04
Operating expenses (including wages)	1	3.38	1.71
Totals	5	7.37	7.75
Average	1	1.47	1.54

INFRINGING TELEPHONERS MADE UNHAPPY.

Judge John J. Jackson decided in the United States Court at Parkersburg the case of the American Bell Telephone Company against the Emner Telephone Company of Charlestown, W. Va., granting a perpetual injunction against the Emner Company. Bushrod C. Washington is president of the Emner Company.

The Cushman-Bell telephone case before Judge Blodgett was closed up by that judge's opinion, for which the expectants have waited so long, on the 21st instant. The paper is exhaustive and lengthy, and settles about the last of the telephone litigations. In every instance, the defense has claimed that that particular case was entirely different from any and all the rest, and, of course, must win, and the facts in the case go to show, each time, that just before they do—they don't.

The Bell Company in the meantime is making bonfires of infringing instruments and winning suits all over the country, and the hello business is possibly to expire upon a peaceful death bed, when its lease of life runs out by limitation.

IMPORTANT DECISIONS IN ENGLAND.

Since our last issue went to press decisions have been announced by cable in two patent suits of very great interest and importance in electric lighting which have been pending for some time past in the English courts.

The first of these was the suit of the Edison-Swan Company against Holland, which was tried before Mr. Justice Kay. The real defendant in this case was the Anglo-American Brush Company, Holland being a customer of the latter company, using its incandescent lamps under a guarantee of protection.

Two patents were involved, the Edison English patent No. 4576, of 1879, and the Cheesbrough English patent No. 4847, of 1878.

The English Edison patent is substantially identical with Mr. Edison's patent on the incandescent lamp taken out in this country in January, 1880, and claims broadly a carbon filament enclosed in an exhausted globe made entirely of glass, with the leading wires passing through the glass.

The Cheesbrough patent was in reality taken out by Sawyer & Man, Cheesbrough being merely their patent agent. It is owned in England by the Edison-Swan Company, who purchased it from certain gentlemen in New York who were the assignees of Sawyer & Man; it is owned in this country by the Consolidated Electric Light Co., which was organized for the purpose of operating this and the other patents of William E. Sawyer and Albon Man.

The court decides that the Edison patent is void, but sustains the Cheesbrough patent and declares it embraces one of the most beautiful applications of science to the useful arts.

The trial occupied several weeks and was a very exhaustive one. About all the leading counsel and experts in England took part in it on one side or the other, and the testimony on the scientific points involved was very interesting.

We have not yet received the full text of Judge Kay's decision, but the substance of it, as given by cable, is to the effect that the claim is far too broad in view of the prior patents of King, Lane, Fox and others, and that the directions given in the specification for making a carbon filament are insufficient.

For a number of years, heavy litigation has been in progress between the Consolidated Electric Light Company and the Edison Electric Light Company with respect to the fundamental inventions which control the business of incandescent electric lighting. Those inventions relate especially to the manufacture of the incandescent lamp, and may be divided into two classes:

First, the material for producing the incandescent burner; and, *second*, the method of making the same.

The Consolidated Company does not claim a carbon filament of high resistance, which is the broad claim declared invalid by the English courts, but does claim that the invention consisted in the discovery that a carbon made of a fibrous or textile material was necessary for the production of an incandescent burner, and received a broad patent therefor. The Consolidated Company also claims that such carbon for commercial purposes must be treated electrically in a hydro-carbon bath, whereby its electrical and mechanical qualities are vastly improved, and also that the occluded gases must be electrically expelled from it after it is put in the lamp, and during the process of exhausting the lamp of oxygen; and for this purpose, they hold the patent issued to Sawyer-Man in this country.

The history of the invention covered by the Cheesbrough patent is quite a curious one, and makes the present position of the different companies with regard to it somewhat complicated. Sawyer-Man took out the English patent for this invention in 1878, and obtained a corresponding United States patent in 1879, which is now owned by the Consolidated Electric Light Company, as stated above. The English patent was purchased by the Edison-Swan Company, and has now been sustained in that country for the second time. In this country Mr. Weston filed an application which the United States Electric Lighting Co. claim is a similar invention, and subsequently a patent was issued to him covering his process which now belongs to the United States Electric Lighting Co.

The second decision was that made by Mr. Justice Kekewich in the case of Ferranti *vs.* Gaulard and Gibbs. This was a suit brought by Ferranti to cancel Gaulard and Gibbs' English patent No. 4,362 of 1882 involving their claims to a monopoly of the system of distribution by secondary generators or transformers which have created so much discussion and attracted so much attention in England and in this country.

Ferranti had put a transformer plant of his system into the Grosvenor gallery, and the Gaulard and Gibbs Company had sued the proprietors of the gallery for infringement of their patent. Ferranti then applied to the court to have the Gaulard and Gibbs patent cancelled on the grounds of want of novelty, lack of utility and anticipation of the invention by the prior patents of Jablochkoff, Edmunds & Normandy, Fuller, Harrison and others. Before the trial of the case, Gaulard and Gibbs amended their specification and claims, and limited the patent to the use of high tension currents in the primary circuit, which made it conform more closely to the patent they took out in this country in 1886 and assigned to the Westinghouse Company. It was this amended specification that was before the court in the case just decided.

In this case, also, there was a very imposing array of eminent counsel and experts, and the trial excited great interest in electric lighting circles, as the patent involved was a very important one.

Judge Kekewich decides that the patent is void, and as far as we can gather from the cable despatches, bases his decision upon the lack of patentable novelty in the invention, and insufficient description in the specification.

We shall have something further to say in regard to these cases and the probable effect on the interests involved, when we see the full text of the decisions.

OUR CHICAGO LETTER.

(Special Correspondence.)

I happened in at the Electrical Supply Company's establishment the other day, and Mr. Taylor, who is Mr. Terry's first lieutenant, was having a quiet laugh to himself.

He had an order for wire, which was a curiosity. The foreman of somebody had made a requisition on his principal for a number of feet of wire. The principal, in haste, inclosed the requisition instead of making an order, and the envelope had been misplaced before it reached Mr. Taylor, so that he had an order which had neither date, locality or name of writer, and of course there were no shipping directions. The only clue lay in the request for "more wire."

So Taylor took a header into the depths of recent correspondence, fished up a letter in the same handwriting, and shipped some "more wire," same as the last.

Some one has discovered that the flowers and feathers on the bonnets of the dear girl population are held there in defiance of law, and in the face and eyes of Prof. Barrett and his little army of wire hunters. The office boy remarks, that

> The flowers and feathers the pretty girls wave,
> High over each tall bonnet's crown,
> Will soon to the earth be degraded, I fear,
> If Barrett should order them down.
> You ask why he can't leave the dear girls to wear
> Such trimmings as each may desire?
> You seem to forget it's his duty to stop
> The stringing of overhead wire.

The city prosecutor has partially upset some of the best features of the telephone and bridge ordinances. There is an ordinance which, at the time of its passage, was hard fought by the vessel interests, which limited the time of holding the bridges open ten minutes, and, in case of necessity, at the expiration of the next ten minutes, the vessel men could again claim the right to pass. Some time ago a bridge was held open by a vessel

over twenty minutes, and the city ordered the arrest of the guilty party. The city prosecutor took a non-suit, because, as he said, the accused could in turn sue the city for a detention of over ten minutes at the same bridge, and recover more than the utmost fine the justice could award in the case mentioned.

The engines for the new city plant will be ready in about ten days, and Prof. Barrett is getting ready to extend the wires for street lights as fast as possible. In all streets that cross the river the lights will be bunched as far as practicable, in the neighborhood of the water. One line of lamps will run along Michigan avenue from Rush street bridge to Madison and thence west to the river. From the river on the west side a line of lights will be placed from Van Buren street bridge to Halsted, north to Washington and east to the tunnel. On West Madison it is the intention to place lights at frequent intervals as far as Western avenue. The city will be pretty well lighted up by the time of the next Chicago meeting of the Electric Light Association.

The Western Electric Company has received an order from the Mansfield, O., Electric Light and Power Company for a forty-five light dynamo, which means an increase of the original plant.

In New Orleans, at a recent meeting of the City Council, a petition of the residents and property-holders in the vicinity of the Brush Electric Light station asked its removal to some more isolated locality.

Before the Council could act in the matter, a change of venue was ordered by fate, and the plant was removed without legal proceedings.

On Monday, the 16th, at an early hour, the plant was destroyed by fire, which originated from the dropping of a lighted lamp into a bucket of oil.

Almost instantaneously the brick buildings comprising the plant, Nos. 99, 101, 103, and 105 Dryader street, seemed to be completely enveloped in flames. As quick as thought, too, the 350 arc lights and some 6,000 incandescent lights scattered through the city went out. Something less than a thousand telephone subscribers rang up "Central," and asked for the "Brush Company" to find out what was up with our lights!

The parish prison, work-house, police stations, court-house and City Hall, as well as nearly every club-house and the principal newspaper offices were lighted from that plant.

Something delayed the turning in of an alarm, and when it did come, the fire alarm office was in darkness. The lights had gone out, and as there was no gas in the office and no lamp, Mr. Hessel, as soon as possible, lighted a match, set his repeater, and started the alarm. But before this had all occurred the light from the blazing building had started one engine—No. 5—which was well over to the fire before the alarm came from the fire alarm office.

The loss is estimated at about $125,000, while the insurance reaches $75,000.

There is a lesson in this case which should not go unheeded. A few seconds lost at the outbreak of a fire may mean great loss of property, and perhaps of human life, and a delay of this nature is possible with any fire alarm system where electric light alone is depended upon, or where gas is the only illuminant. A fire, as in this case, may cut off the current; an explosion or falling of a bridge or building might sever the wires and produce instantaneous darkness, in the first instance, and an accident to a gas main might result similarly, in the second. The chances will be reduced to a minimum with a hanging lamp or a gas jet directly in front of the repeater stand.

The New Orleans plant will be running again within a month, and it is to be hoped that experience will have shown that truly good man, Mr. Bill or somebody, how to make the new station very much more convenient and far more tasty than the old one.

The Barclay Brothers have removed to the Rookery building (the Rotunda), where they will be pleased to meet friends and give information as to Holmes, Booth & Haydens and Sprague motor matters. The office is a decided improvement on the former one.

Chicago, July 23, 1888. C. C. H.

OUR ALABAMA LETTER.

(Special Correspondence.)

ANNISTON, ALA., July 17.—Mrs. Hardy has filed a suit against the Georgia Electric Light Company for the land on which this company's new plant is now being constructed in the city of Atlanta. The real estate is worth about $6,000. Mrs. Hardy seeks to eject the electric light company from this land, claiming that one Twitt made a trust deed to it to Mr. Pitts, the first husband of her aunt, with the remainder to her niece, Mrs. Harris, now Mrs. Hardy. Mrs. Pitts, afterwards Mrs. Marvin, having died, Mrs. Hardy steps in and lays claim to the land.

The Brush-Westinghouse electric light plant on Dryader street, New Orleans, was burned on the morning of the 15th instant. The city hall, parish prison, police stations, and levee were furnished light from this plant.

The East Tennessee, Virginia and Georgia Railroad Company have crossed swords with their telegraphers and have ordered them to withdraw from the Order of Railway Telegraphers.

Mr. G. E. Evans, who was for a long time the former night operator of the Louisville and Nashville Railroad at Clanton, Ala., has just been appointed station agent of the Louisville and Nashville and the East Tennessee, Virginia and Georgia roads at Calera, Ala. Mr. Evans is one of the most efficient and courteous employés in the service of the Louisville and Nashville Company, and well deserves the promotion he has received. His appointment has given universal satisfaction, and is highly gratifying to his numerous friends.

Mr. A. G. Edwards, of Tuscaloosa, Ala., has been appointed as one of the day operators in the Louisville and Nashville train dispatcher's office at Birmingham, Ala., in place of Mr. R. B. Wimpy, who was promoted to chief clerk in the general's office.

The business of the Western Union Telegraph Company at its office in Anniston, Ala., has more than doubled within the past fiscal year under the vigorous administration of the courteous and obliging manager, Mr. Moseley.

Owing to the placing into position of a new pump at the water works in Annniston, Ala., whose engine and machinery propels the dynamos of the Anniston Electric Light Company, the city has been without electric lights for the past couple of weeks; fortunately, however, the works of the Anniston Gas and Light Company have just been completed, and the city has a contract with the company for 100 lights, all of which have been burning brightly, and have supplied the absence of the electric lights.

The Queen City Electric Light Company of Gadsden, Ala., has ordered a new dynamo. This company is said to be in a very flourishing condition.

The Troy Telegraph Company, of Troy, Ala., has been organized, with L. M. Bashinky as president.

The Little Rock Electric Light Company, of Little Rock, Ark., are enlarging the facilities of their plant to quite a considerable extent.

Mr. Thompson and associates from St. Louis, Mo., have purchased three dynamos, and will erect an incandescent electric light plant at Pine Bluff, Ark.

The Gas Light Company of Athens, Ga., are thinking of erecting an electric light plant.

Mr. W. A. Robinson, representing the Thomson-Houston Electric Light Company, has entered into a contract with the city of Brunswick, Ga., to light that city, and will build an electric light plant at once.

At Ludlow, Ky., E. V. Cherry, H. G. Rich and H. T. Crane have incorporated the Hill Electric Works, with a capital stock of $10,000, for the purpose of manufacturing and selling electrical appliances.

The Congaree Gas and Electric Light Company of Columbia, S. C., have made a contract with George B. Edwards, of Charleston, S. C., to erect their plant. They contemplate erecting a building large enough to enable them at any time to double the capacity of their plant.

The New Mexico and Texas Telegraph and Telephone Company has been chartered at El Paso.

The Lynchburg, Va., Street Railway Company contemplate running their cars by electricity. E. H. O.

An Important Announcement.

Our readers will find in the advertising columns a noteworthy circular issued by the Sawyer-Man Electric Company, commercial agent of the Consolidated Electric Light Company, wherein they appeal to the lamp consumers for the adoption of a uniform lamp socket, and state that such innovation would benefit them thereafter in reducing the cost of incandescent lamps by simplifying the mode of manufacture. The company offers liberal inducements to bring this about, and, at the same time, announces a reduction in the prices of their lamps.

The Sawyer-Man Electric Company evidently mean to capture the lamp trade of its many competitors, and has in the last four months increased its business to such an enormous extent that it is compelled to make a large addition to its steam plant and to reorganize many of its departments in consequence of such increase. It has just created a special selling department, and has put the same under the charge of Mr. P. H. Alexander, well-known to electrical men in the country. He will have the title of general agent, and will be found hereafter at the executive offices of the company.

This action of the Consolidated Electric Light Company, as exhibited in the circular of its commercial agent, the Sawyer-Man Electric Company, following so closely upon the heels of the recent English decision, is pregnant with big results.

Electric Motor Notes.

The Boston Dental Association has put in electric fans. The association is alive to the improvements of the day.

The Montgomery, Ala., Electric Street Railway plant which was recently burned will be rebuilt, the company having contracted for new machinery.

Among the recent sales by the Sprague Co., are one 25 horse-power motor to run a grist mill in Scranton, Pa., and a 25 horse-power motor to run a shoe manufactory at Brockton, Mass. This is being watched by the shoemen, and as one of them said, "if this does the work satisfactorily, it will make a revolution in the shoe business."

In New Orleans the electric motor business has grown so rapidly that the Baxter people of Baltimore have had to send two experts there to set them up and start them, and give the new men of the lighting company points on driving the motors. From twelve to fifteen horse-power per week is being sent to New Orleans by the Baxter Co.

The Transcontinental Aerial Navigation Company, of Chicago, held a meeting on the 12th instant, and decided to increase its stock from $150,000 of 1,500 shares to $10,000,000, par value of the shares remaining the same as before. The company also increased its board of directors from three to nine members. This is the company which is backing Dr. De Bausset and his air ship.

The amount of business done by the Baxter Motor Company of Baltimore is well shown by the fact that the company's orders for the month of June were four times as large as those for the month of January. This is a remarkable growth, particularly so when it is remembered that the company was not in position to fill orders on an extensive scale until September of last year. The energetic management of this company, and the fact that it owns a splendid motor, are the elements that have won this great success.

Monroe, Mich.—The Monroe Electric Light and Power Company is incorporated, capital stock, $12,000.

Eau Claire, Wis.—A company is being organized here for the purpose of lighting the town by electricity.

New York.—Articles of incorporation were filed last week by the International Post Electric Company, capital $100,000.

Portsmouth, N. H.—The capital stock of the Portsmouth Electric Light Company has been increased from $25,000 to $50,000.

Jamestown, R. I.—The Light and Water company, Geo C. Carr, president; Pardon Tucker, treasurer; and D. Watson, secretary.

Chicago, Ill.—The American Telephone and Telegraph Company, of Illinois; capital $10,000. Incorporators, Russell C. Witmore, William Speirs and Albert E. Rawson.

Ludlow, Ky.—E. V. Cherry, H. G. Rich and H. T. Crane have incorporated the Hill Electric Works, capital stock $10,000, to manufacture and sell electrical appliances.

Laurel, Md.—The Electro - Automatic Transit Company is organized, and is erecting a generating plant and a railroad about two miles long to test the appliance.

Tacony, Pa.—The Tacony Fuel Gas Company, has been incorporated, and a plant is to be established at once. Capital, $100,000. For details address Thomas W. South.

Utica, N. Y.,—The Mohawk Valley Electric Light Company, of Utica, has been incorporated, with a capital stock of $35,000. C. K. Grannis, D. O'Connell and others are corporators.

East St. Louis, Mo.—The Residence Electric Light Company, of East St. Louis, has been incorporated with $25,000 capital stock. Those interested in the company are W. L. Hill, Charles Sutter, and C. H. Holmes.

Chicago, Ill.—The Chicago Electric Motor Company of Chicago; capital $30,000; for the manufacture of electric machinery and appliances; incorporators, R. H. Garrigne, J. C. Scroggs, J. H. Caswell, and H. S. Tiffany.

Chicago, Ill.—The Chicago Insulating and Construction Company. Capital $250,000, to do a general manufacturing business, and deal in insulating materials and supplies. E. B. Palmer, E. A. Mulford and T. M. Hunter are the incorporators.

Chicago, Ill.—The American Liquid Electograph Manufacturing Company was recently incorporated to manufacture liquid electographs, with $250,000. Wm. Vogel, C. A. Ploger and Joseph Steinhoff, incorporators.

East St. Louis, Mo.—Bross Compound and Manufacturing Company, East St. Louis; capital, $50,000; for the manufacture of compounds for cleaning and removing scales from boilers, engines, etc., and to deal in engineers' supplies; incorporators, Frederick M. Colburn, John P. Brougherand, and Davis R. Boogher.

Lawrence, Kas.—The Gas, Coke and Coal Company's amended charter changing the name to the Lawrence Gas, Fuel and Electric Light Company. This corporation is formed for the purpose of manufacturing and supplying gas to public and private consumers for illuminating and heating purposes, and for the purpose of manufacturing and generating electricity for the purpose of furnishing electric light for public and domestic use. Capital, $117,000.

Telephonic News

*** The Portland & Vancouver Railroad Co. will establish a telephone line between Portland and Vancouver.

*** A new primary battery, the invention of Chas. E. Egan, of Columbus, is reported. He is said to have interested a number of Washington officials.

*** The curious sight of an electric car towing a "bobtail" car was noticed in Richmond, Va., last week. Thus does electricity conquer and lead captive.

*** The City of Philadelphia now wants the $50,000 promised it by the B. & O. Telegraph Company should it ever consolidate or merge with any other telegraph competing company.

*** The telephone fraternity read with much interest the account of the new telephone work by Messrs. Vail & Seely, which appeared exclusively in the ELECTRICAL REVIEW recently.

*** It is expected that New York will be connected with Buffalo, by Fall, through the medium of the wires of the long distance company. This will be the longest telephone line in the country.

*** Mr. Edison denies the rumor that was heard on Wall street to the effect that he had sold his right and interest in the phonograph to the English syndicate for $250,000. He said he knew of no syndicate formed for such a purpose.

*** The French copper syndicate is raising a hurrah over a proposal to enter upon an extension of its contracts with American mines, all to help along the boom which they hope is going to enable them to unload what copper stocks they have remaining in their "load."

*** The long distance telephone service between New York and other connected cities is increasing most satisfactorily. This company has been ably managed and is rapidly creating a new method of transacting business. Commercial circles, when fully realizing the great advantages of this system, will wonder how they got along without it.

*** Corporation Counsel Beekman informed the Commissioner of Public Works that there was no question of law involved in the "dead" poles question about which Gen. Newton asked advice on the 7th inst. He should satisfy himself by diligent inquiry whether the poles were carrying "live" wires or not, and if he found that the wires were not in use, then it would be his duty to remove the poles just as if they were any other kind of obstruction in the streets.

*** During the past five years the Western Union system on the Pacific coast has been more than doubled, and Supintendent Jaynes says the next five years will doubtless see an increase fully as great. Thousands of dollars are being spent every week by the company to make the service equal to the growing demands. New lines are now being built from San Francisco to Portland, and from here to Los Angeles, by the coast route. There is now a two-wire line to Portland, but the system will be doubled, and three wires will be strung, it is thought, before the next winter season begins.

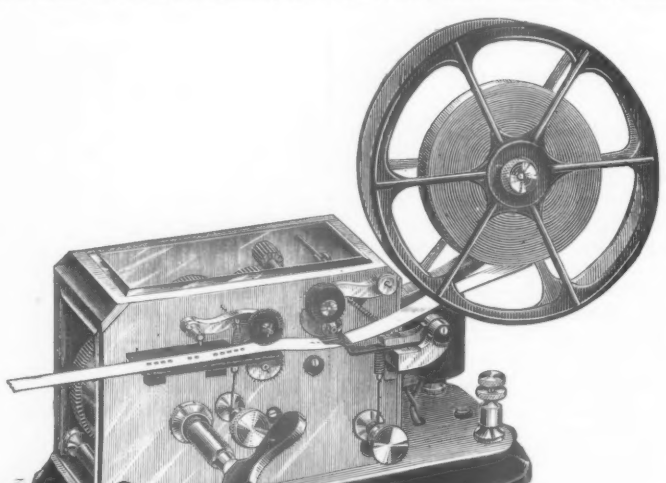
*** Frank Ingram, a lumber man, and Lee Otto, a machinist, of Louisville, Ky., had a business transaction by telephone one day recently. The men at first got along smoothly, and were completing their business at a rapid rate. But toward the close both got angry and began cursing each other over the telephone. Ingram was the most violent, it is charged, and used very abusive language toward Otto. Otto being enraged at this language, went to the City Hall and got out a warrant for his arrest. Now we will see what the Judge thinks of telephone swearing. Subscribers are fined for it in Germany.

A New Automatic Register.

The automatic starting and automatic stopping register which we present on this page is the outgrowth of the long and careful study given to telegraph registers in general by The E. S. Greeley & Company, of this city. In the old-time Morse register it was customary to start the instrument by moving a lever, and to stop it in the same way. Then for district telegraph uses it became necessary to make an instrument that would start automatically as the calls came in without warning. This was done and the stopping was effected by the closing of the circuit when the call was recorded.

A weakness in this system of registration lay in the fact that, on a closed circuit, should the wire be permitted to remain open for an undue length of time, the paper would continue to reel off as long as the clockwork continued to move. The result of this was that in event of a break occurring in the line and the break not being discovered, it frequently happened that when a call came in there was no paper ready to receive it or else that the instrument was entirely run down.

By a very clever invention, however, this difficulty has been overcome in the form of instrument as manufactured at the present time by The E. S. Greeley & Company. It is now immaterial whether the instrument is used upon a closed circuit and the circuit remains open accidentally, or whether it is used upon an open circuit and the circuit should be closed accidentally. The Greeley register is double-action and automatic, starting and stopping upon either or both the open and closed circuit. There is a provision upon the instrument for adjustment of the interval of time through which the instrument will work upon a single impulse, so that from one inch to a dozen inches of paper tape, at pleasure, will run through the instrument upon the completion of each signal.



A NEW AUTOMATIC REGISTER.

This feature proves a very valuable one, as was evidenced by the encomiums passed upon it at the annual meeting of the Railway Telegraph Superintendents, at the Murray Hill Hotel, this city, where this register was exhibited in working order from the 11th to the 13th inst.

By its use train despatchers will be enabled to keep a complete record of the workings of any Morse wire, and as the instrument is manufactured, when so desired, with double pens, a single machine may be made to keep the record of two distinct circuits without interfering one with the other.

Such a record will, of course, set definitely at rest all question of responsibility in the transmission of train orders. Where these orders are sent on sound instruments and no written record is made, dispute frequently arises as to whether the error was made by the sender or the receiver of the despatch, and there are no means of determining conclusively where the fault lies.

As the record is written and passed through the machine, by means of an automatic paper winder, the record is rolled up in the same form as when originally placed upon the register and can be filed away in neat, compact rolls for ready reference. Where the business is not heavy a single roll, five or six inches in diameter and one-half inch wide, will contain a full day's record, while on busier wires a separate roll can be used for the A. M. and P. M. business and be so indorsed.

This instrument is now used with much success in fire alarm service, on the circuits of which it gives entire satisfaction. The various devices which tend so much to making the accomplishment of the desired object a success in this machine are considered so important by the manufacturers that several patents are pending for the same.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

"We are not doing a thing." That has been the cry of every electrical man, to a question as to his business during the past two or three weeks. It is just harvest time and the West is devoid of money. Plenty of business could be done on credit, but cash is the only kind of talk that interests the electrical man. Everybody is hoping for a great and sudden improvement, however, as soon as the harvest is over, and the farmer has disposed of his farm's products. Never before has Kansas and the West yielded so beautifully. Every kind of a crop, wheat, corn, oats, rye, barley, potatoes, hay, fruit, etc., is greater and better than ever before. Nature has so mixed the rains and sunshine that the farmer had nothing to do but to sit at one side and behold fabulous wealth emerge from the ground around him, and ask only to be garnered.

Of course, there has been a little business done. It couldn't be helped. The Western Electric Construction Company's agency in this city has secured the contract for equipping the plant of the Fort Scott, Kas., Electric Light and Power Company. The plant will have a large capacity. The local agency of the Thomson-Houston Company will put in 800 lights for the Fort Scott Company at once. The same agency has secured the contract for 50 electric lights at Excelsior Springs, Mo.; 70 lights for the gas company's electric light plant at Lawrence, Kas.; 30 arc and 500 incandescents for the Oswego, Kas., Electric Light Company; 70 arcs and 1,600 incandescents for the Pine Bluff, Ark., Water Supply Company, and for equipping the Riverside and Suburban Electric Railway of Wichita, Kas.

This last contract is a rather important one. It is the only electric railway in Kansas. It will be six miles long when completed, but only two miles of it will be constructed now. The contract calls for six motors, six cars and two 50 horse-power electric generators. The single overhead wire will be the system used. The contract price is near $60,000.

Mr. Cone, who represents the Electrical Supply Company of Chicago, remains as elusive as ever. When he isn't rushing through Iowa, he is in Colorado. When he isn't in Colorado, he is drumming up the denizens of Kansas or Missouri. The Irishman's flea is an eternal fixture in comparison with him.

TELEPHONE NEWS.

"The State line isn't far. We will have to move soon any way. It wouldn't cost us much more to move two miles than to move across the street. If the exchange is in Kansas we can dictate rates to suit ourselves, and no man can molest us, or make us afraid." These were the sententicus remarks of Superintendent Smith when I asked him about the proposition to reduce the rates of the telephone company in this city. It was all on account of St Louis. The St. Louis council passed an ordinance cutting the rates of the telephone company there from $100 to $50. The telephone company objected, of course, and the case is now in the hands of the State Supreme Court and will be decided at the October term, and the question settled whether a city has the power to regulate the rates of a telephone company to which it has granted a franchise. Well, of course Kansas City is not going to allow St. Louis to do any thing ahead of her. The business men discussed it among themselves, and decided that the rates were too high, that the company was making too much money, and especially that Kansas City should not allow St. Louis to outdo her in anything. They called on the mayor singly and in squads. They succeeded in impressing him with the idea that the telephone company was an exorbitant monopoly. He requested the city councilor to investigate the law and the facts in the case, and, if he found it possible, to prepare or suggest the form of an ordinance for the reduction of the telephone rates. The mayor also sent a communication to the council, calling their attention to the fact that there was a "universal complaint with our citizens in regard to the price they were compelled to pay for telephone service." He asked the council to investigate the matter and pass such ordinances as would compel the telephone company to furnish telephone service at "reasonable rates." At the same council meeting Mr. A. C. Hawlew, an official of the Interstate Telephone Manufacturing Company, informed the council that he was willing (and would be able to do so) to organize a company that would furnish telephones for $50 a year.

Mr. Smith states that the telephone rates now are $72 a year for all telephones within three-quarters of a mile of the exchange, and $9 additional for each additional quarter of a mile, and he says they ought to be higher; that the company wasn't making any money out of it to speak of; that a great many improvements and enlargements were being made and were constantly increasing; that the exchange would soon have to move to other quarters; that the number of operators and other employés of the company was increasing rapidly, and with a greater ratio than the number of telephones were increasing, and that those and other reasons that need not be mentioned were what compelled him to make the statement that the present rates were too low, that the company couldn't operate, except with a loss, at reduced rates, and that in case of such a reduction he would recommend to the directors to abandon the plant or remove it to Kansas.

Mr. Smith is not at all frightened by the possibility of another company taking the place of the Missouri and Kansas Company. "There are three objections to that," he said; "one is, that such a company could not in all probability secure the right to use the Bell telephone here; if it did not secure the Bell telephone, and attempted to use any other, it would in all possibility be closed up by the Bell Telephone Company by means of a suit for infringement on patent. If by any means a company did secure the Bell telephone, it would require more capital to operate an exchange in this city, with the rates at $50 a year, than could be secured."

Mr. Joseph E. Cobb, who has charge of the introductory for this year's directory, has received some interesting statistics from the telephone company's headquarters, at Boston, regarding the service in this city. In January, 1884, there were 451 instruments in use; in 1886, 1,242; and at the present time there are 2,415. This is the largest number used in any city in Missouri, St. Louis having only 2,070 instruments in use, and Kansas City stands eighth in the list of cities in this country. A list of calls has shown an average of twelve per day for each instrument, an excess of four over any other city in the United States. At present there are thirty toll stations connected with this exchange, an increase of ten over a year ago, the farthest point from Kansas City being 138 miles.

KAWSMOUTH.

Kansas City, Mo., July 12, 1888.

More Information Touching Underground Matters and Alternating Currents Brought Out at Meeting of Board of Electrical Control.

The Board met in the private room of Wallack's Theatre, on the 16th inst., to discuss the papers which had been received and were to be read relative to a letter written by a H. P. Brown and published in the New York *Evening Post*, June 5th, and headed "Death in the Wires."

Commissioner Gibbens read from the *Evening Post* of June 5th, 1888, a letter, as follows, on the subject of electric light wires, written by Harold P. Brown, of New York, in which the writer concludes by advising that the Board of Electrical Control adopt certain rules for station lighting:

To the Editor of the Evening Post:

SIR:—The death of the poor boy Streiffer, who touched a straggling telegraph wire on East Broadway on April 15, and was instantly killed, is closely followed by the death of Mr. Witte in front of 200 Bowery and of William Murray at 616 Broadway on May 11, and any day may add new victims to the list. After every such accident the newspapers clamor to have the wires placed underground, while the electricians connected with the system at fault hold their peace or throw the blame on the telephone wires, until the matter has been forgotten. As an electrical engineer I know that burying the wires would not remedy the trouble, though it would largely diminish the risk, while the enforcement of a few common sense regulations would make it almost impossible to kill a man from an arc light current. It will not do for electricians to state that they "don't know what killed that man," for unless they take prompt measures to make their business safe some terrible accident will cause the adoption of laws to regulate electric lighting, which, being framed by their enemies, will cripple or destroy their business.

So, at the risk of offending some corporations having heavy investments in unsafe systems, I will venture to state a few facts which I trust the press will be kind enough to publish widely, as no disinterested electrician will deny my statements.

It is well known that a continuous current of "low tension," such as is used by the Edison Company for incandescent lights, is perfectly safe as far as life risk is concerned. From this fact the false popular impression has arisen that all incandescent systems are safe and all arc systems dangerous. But it is not to the "low tension" alone that this current owes its safety, since a factor fully as important is the even, steady quality of its delivery. That is, a current of "high tension," but unbroken and continuous, *may* be perfectly safe if properly operated, while a current of lower "tension," but wavy or pulsating, is *always* dangerous. And when these pulsations rise in speed and intensity the danger increases, until the climax is reached in what is called "alternating current" in which impulses are given first in what direction and then in the other several thousand times a minute.

To understand the reason for this it is necessary to remember that when a current through a wire or other conductor is made or broken, a current in the opposite direction is "induced" in any parallel conductor; the same effects are produced in a less degree when the first current pulsates, but are intensified when it is alternated or reversed in direction. Any one who has held the metal handles of a "medical" (Galvano-Faradaic) battery, has had a practical experience of the power of induction and pulsation; in this apparatus the current from the battery itself is so feeble that it cannot be detected without the use of instruments, except by the metallic taste when the terminals are touched by the tongue. This insignificant current is passed through a short piece of insulated wire coiled around an iron core, and is interrupted by a rapidly vibrating armature, thereby inducing in another and longer coil of wire surrounding the first a series of shocks whose intensity can produce most intense suffering or even death in a human being who forms a portion of the circuit. It is this rapid succession of shocks that kills, while a single steady impulse of the same intensity would do little damage.

Two of the leading arc lighting systems have dynamo-electric generators provided with what are known as "open circuit armatures," which produce a pulsating current somewhat similar in kind to the one just described, though a thousand times more powerful. It is to this current that nearly all the deaths caused by arc lighting systems must be attributed. These "open circuit armature" systems were pioneers in electric lighting, and at the time they were invented it was supposed that the "closed circuit armatures" which produce the steady and safer current, could not be made to develop sufficient electro-motive force to operate a number of arc lamps upon one circuit. But the recent advances in the science have made possible "closed circuit armature" generators which give the same amount of current and electro-motive force, with a much less expenditure of motive power, so that there is now no valid reason for the existence of the old type with its pulsating and dangerous current.

I do not mean to have it understood that the "steady" current is always safe or that the "pulsating" is always unsafe, for any current with more than 50 arc lamps in series is dangerous and should be prohibited; while the "pulsating" current, if its circuit is kept thoroughly insulated and carefully watched, and tested every day, may run for years without a fatal accident. But the fact remains that the "steady" current, with 50 or less lamps in circuit, has had, to my knowledge, but four victims against the scores killed and maimed by the "pulsating" current. And even these four were responsible for their fate, since all were employés and should have known better. Three of them tried to disconnect apparatus through which they knew the current was flowing, and thus got into the circuit, while the fourth received the full current while trying to repair a broken wire which he knew was charged.

But the persons killed by the other system, as a general thing, have been in no way responsible for the accidents that caused their deaths; they have, as did young Streiffer, touched or run against an apparently harmless wire when standing on a damp place, or have touched at the same moment some metal accidentally charged with the fatal current, and some other conductor having a "ground" connection, as did Mr. Witte. I do not believe with extremists that the "pulsating" current should be prohibited, but I do think that the conditions of safety should be rigidly enforced by the authorities.

If the circuit carrying the "pulsating" current is perfectly insulated at all times, no accident is likely to occur. But if, through wearing of the insulation or a heavy rain, a connection between the circuit wire and the "ground" is formed, any one who touches the wire and a "ground" will receive a portion of the current; if he happens to be near the other "ground," he receives but a small shock, but if there are a number of lamps between him and the other connection, the shock may be fatal.

Of course the reply will be made that all the arc lighting stations in this country use insulated wire, "as required by the underwriters," but here is just where a great mistake has been made, and the sooner this is corrected the better for the cause of electric lighting. It is an open secret among electricians that the wire known as "underwriter's wire" has a very poor insulation, even when new and during dry weather, but practically no insulation at all during a rain. The paint dries out of it after a few months' exposure, other wires rubbing against it soon wear away the cotton and expose the metal, and it is altogether unfitted for outdoor use. Among electric lighting men it is appropriately called "underwriter's wire," and the frequent fatalities it causes justify the name.

Even with the most conscientious electric light superintendent, who tests his circuit carefully for "grounds" every day before starting the generators, there is no surety that during the run some telegraph wire may not drop upon his circuits, wear away the insulation, and set a death trap for the unwary who may be miles away from an electric lamp.

The condition of the electric light circuits in the lower part of the city is simply disgraceful, as has been previously pointed out. Most of them were first put up years ago; they have been cut and patched until full of joints, from which the tape flutters; the insulation is entirely worn off in places, or hangs in shreds, and few circuits are fit to run with safety for a single hour. They cross and re-cross the structures of the elevated roads; they sag and sway in loose loops, and are intersected at all levels by telephone and telegraph wires. On some of these circuits two or more dynamos are run in series, thus more than doubling the life risk, and it is almost certain that it was these overloaded circuits that killed Streiffer and Witte. If the Board of Electrical Control cannot force the wires underground, they can at least condemn these lines, which the companies can afterwards utilize by reinsulating for their underground circuits. The underwriters ought to have an eye to this also, for every bare or poorly insulated spot is a menace to property as well as life.

But if "influence" prevents the wires from being replaced, and it seems to permit the extension of new wires elsewhere, there are a few simple precautions which, if enforced, will make fatal accidents almost impossible. All the deaths due to arc lighting, as far as reported, have been caused by the victim's breaking the circuit and placing himself in the break to receive the fatal "extra-current" thus caused, or by his making a "ground" connection with a circuit on which there was another "ground." Both of these dangers can be avoided by very simple apparatus.

If a voltameter, or a circuit of very high resistance, be connected across the poles of every arc light dynamo, the external circuit may be opened without producing the death-flash, as most of the "extra-current" will go through the by-pass. This would prevent a large proportion of the fatal accidents. If every arc light dynamo was also provided with a wire of very high resistance leading from the circuit to the "ground," upon which was interposed apparatus to shut off the production of current the instant a second "ground" occurred, no deaths could be caused except by foolhardy carelessness. The latter apparatus could also be used to shut down the current in case the external circuit should be broken.

With these precautions, and with the number of lamps limited to fifty on a single circuit, even the "pulsating" current would be fairly safe, but as the stations are now operated upon circuits with frayed and worthless insulation, they are a constant menace to all who walk the streets, use a telephone or touch a wire.

In regard to the popular impression that all incandescent electric lighting systems are safe, I am sorry to say that recently several companies who have more regard for the almighty dollar than for the safety of the public, have adopted the "alternating" current for incandescent service.

If the "pulsating" current is dangerous, then the "alternating" can be described by no adjective less forcible than *damnable*. With the "pulsating" current, three contingencies must ordinarily arise to produce fatal results: there must be a "ground," connnection on the circuit; a person must touch the circuit at some distance from the first "ground," and must at the same instant be in connection with the "ground" himself. But the "alternating" current produces fatal results by simply touching the two parallel wires, always close together, connections from which enter every house. Its supporters may say that on account of its danger they do not permit the "primary," or death current, to enter the house, but supply the lamps from the "secondary" current. True; but between these two circuits is interposed nothing more than a thin layer of cotton or silk insulation, and, as has happened again and again, it requires but a flash of lightning or a little moisture in the converting appartus to bring the death current to each lamp.

The only excuse for the use of the fatal "alternating" current is that it saves the company operating it from spending a larger sum of money for the heavier copper wires, which are required by the safe incandescent systems. That is, the public must submit to *constant danger from sudden death*, in order that a corporation may pay a *little larger dividend*. I do not know of a single disinterested electrician of high standing who does not condemn the alternating system. Siemens & Halske, a firm of electricians with a world-wide reputation, have spent years of experiment upon it, but have abandoned it as unsafe, and say that its use should be prohibited by law.

Following the example of Chicago, the Board of Electrical Control should forbid the use of the fatal alternating current, and legislatures, city councils and life insurance managers should see to it that stringent laws and regulations be passed to prevent this wholesale risk of human life. The placing the wires of the alternating system underground would only intensify the danger in houses where it might be used, while its use with underwriter's wire in a city like this is as dangerous as a burning candle in a powder factory. If the death of these three men can effect the adoption and enforcement of regulations similar to the following, they will not have died in vain.

RULES FOR STATION LIGHTING.

Not more than fifty arc lights shall be operated upon any one circuit, unless said circuit is used exclusively for street lamps mounted upon wooden poles; in this case the number must not exceed sixty.

All outdoor arc light circuits must be provided with waterproof covering having an insulation resistance of not less than one-half a megohm. Any circuit falling below this must not be used until restored.

No arc light dynamo shall be operated unless provided with a voltameter across its terminals, or other device, to provide a path for the extra-current caused by opening the external circuit.

No arc light dynamo shall be operated unless provided with means for automatically stopping the production of current the instant a ground connection is made upon its circuit.

No arc light dynamo shall be operated unless provided with means for automatically breaking or short-circuiting the field circuit the instant the external circuit is broken, in order to prevent a current from being built up by the broken circuit ends falling upon some conductor.

No alternating current with a higher electro-motive force than 300 volts shall be used.

HAROLD P. BROWN, Electrical Engineer,
201 West Fifty-fourth street, N. Y., May 24.

We have never heard of this so-called electrical engineer who offers these gratuitous statements, and are not surprised at anything we read now in the daily press.

The first paper was from T. Carpenter Smith of M. R. Muckle, Jr. & Co., engineers of Philadelphia, Pa. He criticised the paper of Mr. Brown from many points, and indicated that either Mr. Brown was exceedingly ignorant or else was endeavoring to wilfully mislead the Board; he spoke of his experience with arc and incandescent lighting, the former with the Brush system and the latter the Westinghouse direct and alternating. He had had shocks from both and considered the effect from the alternating less dangerous and not so lasting. He had several times taken the 1,000 volt shocks himself and never felt any after-ill effects. He spoke of one of his men who received 1,000 volts and said it felt as if it "knocked all the filling out of his teeth." He also spoke of the Westinghouse underground system used in Philadelphia, and said he would have no hesitation in placing the cables used there in the New York conduits. For underground conduits would prefer nothing better than one always filled with water under slight pressure. He exhibited a Westinghouse transformer and explained the manufacture and action, dwelling upon the careful insulation and air space between the primary and secondary windings and the improbability of the primary current acting upon the secondary through any cause.

He was followed by S. C. Peck of the Thomson-Houston Electric Co., of Boston, who proved the fallacies of Mr. Brown's paper and explained the methods adopted by the Thomson-Houston Co., for the protection of the lines, transformers, apparatus and the public. He presented these points illustrating the methods of applying the lightning arrester to the circuit and explained the advantages of grounding the secondary and ended as follows: "Having observed the evolution of incandescent lighting and the growth of the business both of the arc lighting system using the open coil armatures, and the alternating incandescent with transformers, I am convinced that both have come to stay. In Great Barrington where the first commercial application was made of the long distance alternating system in the United States, it was favorite pastime of the town boys to see that every new comer got a shock from the transformers which were located on the ground under piazzas, etc. No one was hurt, however. The increase of the business since then has been phenomenal. The Thomson-Houston Co. alone, in the past 15 months, have installed no less than 45 central station plants operating over 25,000 lights from this alternating system, and in the 12 months ending January 1st last, over 13,000 arc lights upon the "deadly pulsating current" dynamos. Are these systems which have stood the practical test of years to be injured by some theoretical suppositions? I think not."

A short letter was then read from Mr. M. M. M. Slattery, of Fort Wayne, Indiana, who after fully describing the apparatus and the precautionary methods used of grounding the secondary, mentioned that 1,100 volts was considered the highest voltage which could be taken with safety on the alternating current. He criticised Mr. Brown's article very seriously from the standpoint of an electrical engineer, in which he was supported in a very able paper read by Mr. R. W. Pope, who, after explaining the extreme ignorance expressed by Mr. Brown in his article, spoke at length upon the rules proposed. Showed that the first one was unfair as it would allow some systems to operate but a little over one-half the voltage allowed others. He ended by suggesting the erasure of the first and last rules and the adoption of the other, could any successful appliances be found which would fill the requirements.

The East River Electric Light Co's paper showed the impracticability of the arrangements suggested by Mr. Brown, and stated that their lines were constructed with high insulations and that they had had no grounds for weeks. They called attention to their rules which compel that their lines be tested often

(three times a day) and that no circuit was ever started with a ground upon it; also suggested that the Board might investigate the appliances suggested by Mr. Brown and see if they were not covered by patents issued to some man or company, the adoption of the rule throwing every company into the hands of such person or persons for royalty. They spoke of the application of motors and welding to the high tension alternating current.

Mr. Vander Weyde made some exceedingly interesting remarks upon an experiment performed upon the late Doctor Kidder in 1862. It seems the Doctor had expressed his willingness to stand any shock which could be given from a frictional machine, and one day at Cooper Institute before medical men and witnesses, took shocks in the form of discharges through his body from a machine producing a 21-in. spark. This showed that volts alone would not kill, it needing amperes combined with high voltage.

Several affidavits were presented showing that 1,000 volts alternating current were not necessarily fatal, and statements made by gentlemen present, many of whom had received the full 1,000 volt shock.

An informal discussion followed between the Press, Board, and the Experts, and finally the meeting adjourned at 5.30.

Mr. Brown, the author of the fallacious article was not present, although invited.

MR. PECK'S PAPER.

The Honorable, The Board of Electrical Control:

GENTLEMEN:—In the New York *Evening Post* of June 5th there appeared an article by one Harold P. Brown upon the dangers to be expected from electrical lighting apparatus. This I have read, and carefully noted his suggestions to your Board regarding certain precautions which he claims should be observed. It appears to me that the article is hardly written in a fair spirit and that many of the comparisons are obviously unjust and incorrect, and the suggestions impracticable.

In the first place, the current from open coil armatures is referred to as "pulsating" and "death dealing," and is described as being much more fatal to human life than the current from a dynamo having a closed coil armature. It seems to me that this is purely and simply a matter of conjecture on the part of Mr. Brown.

I have tried many times to distinguish between the physiological effects of this so-called pulsating current and those caused from a closed coil armature. I have used in all cases sufficient resistance in the main line to give a difference of potential of from 60 to 200 volts. The sensation experienced in each case is precisely the same, as indeed is the effect upon the needle of a delicate galvanometer, which will stand perfectly still when under the influence of a current of either character from a properly constructed machine.

No doubt but a voltage of 2,500 *would* fatally injure any person introduced into the circuit, but the idea that the effect of the open coil armature current would be many times that of the closed coil would be no more than guess-work, for I do not consider we have any reliable data to work from.

Assuming there have more unfortunate accidents upon circuits operated by dynamos of open coil class, what do they prove? It is well known that these dynamos can carry more lights and, consequently, a higher potential than the other style, and who can say that Mr. A. or Mr. B. would have lived had a shock of the same voltage come from a dynamo of the other type? One thing is certain, viz, that there have been fewer fatalities resulting from the electric current than from gas, steam, or any motive power. It is stated that but five men have been killed in New York in ten years.

Mr. Brown compares the alternating current, as produced by dynamos, with that emanating from what is generally known as a medical coil. He, as an electrical engineer, should know that they are in no manner similar, except that they both are bi-direction currents. In the first place, the current from the ordinary medical coil capable of throwing a spark one-sixteenth of an inch in length is immensely greater in pressure than that of the 1,000 volt generators now in use which are incapable of striking through an air space of even $\frac{1}{100}$"; and, again, the current in a medical coil is produced by a direct current being made and broken, inducing currents of tremendous pressure, but of little volume in the secondary. The unpleasant feeling caused by this current is directly traceable to what is known as the extra current, caused not only by the rapid changes in quality of magnetization of an iron core upon which the coil is wound, but by the self-inductive effect of the coil itself.

With the alternating current the case is materially changed. A very small amount of wire is revolved in a field of force which is absolutely constant and is not affected in the least by changes in the external circuit. The amount of potential is pre-determined and controllable. There is no self-induction of any amount to produce the dreaded extra current, and opening the circuit, or introducing one's self into it, merely subjects one to the pressure of 1,000 volts, which has never yet proved fatal. There is no extra current, and no "kick" from the field magnets.

But in supplying incandescent lights from alternating current circuits, it is not customary, for many reasons, to introduce the high-pressure wires into the interior of buildings. Between the primary circuit and the house circuit a transformer is interposed, which effectually changes the character of the current from one of 1,000 volts pressure to one operating but 50 volts.

Mr. Brown states that there is but a thin film of cotton or silk between the primary and secondary windings of the transformer, and that this is liable at any time to be ruptured by a flash of lightning. This shows that he is totally ignorant of the construction of alternating current apparatus as well as the method of installation adopted by the leading houses in the business.

I am familiar with various methods of protection used, and have no hesitation in stating that when such as I shall describe, which have been adopted by the Thomson-Houston Co., are carried out, there is no possibility of the high potential affecting persons through any accidental contact with the secondary wires, even should there be connection between the primary and secondary windings of the transformer. In the first place, this company operates its dynamos at a potential of but 1,000 volts, as against 1,800 to 2,500 used, and so far with safety for the past two years or more, in many places abroad. For every installation of transformers a lightning arrester is used, which is absolute in its action, and effectually prevents any ill effects to the transformer from a lightning stroke upon the line. I have never known one to fail yet. Then the primary winding is separated from the secondary by a very substanial septum of insulating material, thoroughly dried and shellaced, and finally the secondary, or interior circuit, is soundly connnected to the earth. Where is there any danger now? Even if the high potential were to get upon the secondary line, what possible harm could be done? Suppose the primary line in a first-class condition, and the secondary properly grounded as described; also the accidental contact between the primary and secondary. A person touching the secondary, and at the same time making contact with earth, would be affected in what manner? Not at all. Why? Because there is no complete circuit. But go further, and suppose a ground upon the primary as well. A person touches the secondary, and again there is no effect. Why? Because there is a complete shunt about his body caused by the earth and the ground connection, and even if the transformer were not instantly cut out of the circuit by the fuses melting, all the current would go by a shunt which is of no resistance, and would not influence the man at all. Why should Mr. Brown be so set against the high tension alternating current system, when it has been in successful operation for so long a time, and which, even under the worst conditions, could but introduce a potential of 1,000 volts upon a few lamps at a time? Is it not inconsistent, because we find, about a year ago, a description and advertisement of "The Brown Automatic Converter," a modification of a device to be used in running incandescent lights from arc current circuits, "*without involving a large expense for incandescent lighting plants, or the necessity of getting a large number of subscribers to commence with, and also valuable to incandescent lighting companies for customers too distant* for the ordinary incandescent circuits."

Why are no charges made here against incandescent circuits which must have been considered extraordinary? Surely no man so careful for the safety of the "dear public" would advise the use of such an arrangement, which is liable at any time to bring a difference of potential as high as 3,000 volts into a man's house, and this pressure too, of a dynamo producing the "deadly pulsating current," for we read in the advertisement, in capitals, "Used With Any Make of Arc Light Dynamo." To say the least, it looks very curious, and one is inclined to read between the lines when noting an "electrical engineer" stand forth in condemnation of the one successful commercial method of introducing the electric incandescent light; and stating that the use of 300 volts of alternating current is dangerous, but implying that the operation of incandescent lights upon 3,000 volt circuits is not to be condemned when *in conjunction with his "converter."* Let us take up his letter again and turn to the suggestions. In order to discover the presence of a ground upon the line, he advises the use of a permanent ground connection at the station.

Inquire among station superintendents and see how many of them agree with him. In order to keep a line in condition we are told to subject it to a constant strain at every insulator and contact point. Is this wiser than the present method pursued by all properly governed companies, viz: to test the circuits every day, and keep them free from ground? Also to shut down should any vicious connection occur during the night? There is one station in this city which is operated on sound principles. The wires are well insulated and well run, and there has not been a ground on a circuit for weeks.

Again we are told that to prevent the flow of the extra-current through the body of a person introduced into the circuit, we are to place a voltameter or high resistance about the dynamo terminals. Very well, do so, and what will you have? Evidently the resistance must be high in order that too much current may not be going to waste. Now, will not the "death stroke" or extra-current divide itself according to the law of shunts, and will not the person get a good share? If the resistance were constructed as a coil, I am not sure but its effect would be practically useless; and until it is definitely known whether it is the prime potential or the after current which kills, we had better pay more attention to the exterior lines and construction, and less to such traps.

And again, we are to provide a means for automatically shunting the fields, when the external circuit is opened. There is more merit in this than in the other schemes, but I do not think any device could be made sufficiently sensitive to operate in time to protect any person opening the circuit, and at the same time not interfere at improper moments. As there are so many simple and effective methods for determining when the circuit is broken, it does not seem wise to make any such law.

The reference to the Siemen's Co. is not bad. It has been published in several papers in New York and Boston, and all was in the same words. Investigation shows that the company never did make a business of manufacturing alternating current apparatus other than a dynamo, which is to-day for sale by them in Europe. Perhaps the reasons why they did not manufacture can be found in the records of the Patent Office, or maybe Rankin Kennedy's articles on alternating current apparatus would prove of assistance to those desiring a partial idea of the true state of affairs abroad.

The position of Chicago and its inspector is well known.

We read last that the "damnable" alternating current should not be permitted in higher voltage than 300, and that if the proposed rules are adopted three men shall not have died in vain. It can only be said that most of the rules as well as the letter show, under a philanthropic exterior, distinct bias, which perhaps may be accounted for when we recall Mr. Brown's connection with the American Co., whose dynamo has a *closed coil armature*. It would be interesting to read the opinions expressed by Mr. Brown when he was engaged in installing the plant of the Brush *open coil* system in Eau Claire, Wis.

A summary of Mr. Brown's paper may be made as follows:

First.—The alleged comparison between the effects from a medical or Galvano-Faradaic coil, and the alternating current dynamo, does not exist.

Second.—The death-dealing quality of the current from dynamos having open coil armatures, is but conjecture.

Third.—Placing a shunt of high resistance about the terminal of the dynamo is impracticable, and would but partially compensate for the after or extra current.

Fourth.—It is not clear that death is caused by the after current or "kick" of the machine. In fact it is probable that such extra current is not essential, from the fact that fatality has occured from simple connection with a grounded wire.

Fifth.—A constant ground on a high tension dynamo in order to detect a second one is poor engineering.

Sixth.—A break in a circuit would be indicated by the performance of the apparatus in the station, and the one in charge should shut down without any further notice from a complicated device which might render steady commercial service questionable.

Seventh—Under no circumstances should 300 volts be made the limit allowed alternating current service, because practical demonstration extending over a period of two years shows that where the proper protecting devices are used there is no danger.

In conclusion the writer would suggest that in the action already taken by your Board regarding overhead construction, is to be found the solution of the danger problem. Of course the electric current under certain conditions is dangerous, but not more so than steam or various forms of motive power. What is needed is Control and not Prohibition. Look over the lines last constructed in your city and note that any danger from them must be preceded by some accident not traceable to the installation or operation of the plant. A stone upon a rail may wreck a train. A boiler under 150 pounds of steam is subjected to greater strain than one with 50 pounds, but by strengthening the construction we keep the steam in. Follow rule No. 2 suggested by Mr. Brown and let us use better insulated wire. Whether it be Cowles or Simplex, Trinidad or Bishop's, makes little difference, but keep up the standard. The extra first cost of an installation even with the most expensive wire will not average more than 5 per cent. on the total investment, while the percentage improvement in dividend paying quality of plant is not to be estimated.

Respectfully submitted,

(Signed) S. C. PECK.

New York, July 12, 1888.

MR. SMITH'S PAPER.

608 CHESTNUT ST., PHILADELPHIA, PA.,
July 6th, 1888.

W. H. BROWNE, ESQ.,
New York City, N. Y.

DEAR SIR:—Your letter of the 13th ult. to hand, in which my attention is called to an article in the New York *Evening Post* of June 5th, 1888, headed "Death in the Wires," signed by Harold P. Brown, which contains some very sweeping assertions and also lays down the law in a manner to which, I am sure, no practical electrical engineer would commit himself.

Mr. Brown's statement that no disinterested electrician will deny his statements, I think is very correct. Some of his statements are hardly worth denying, and it is only the fact that they are apparently published in the interests of a particular corporation and for the purpose of taking advantage of the fears

of an uninitiated and justly anxious public, that makes it worth while to answer any of them.

If Mr. Brown had confined himself to showing that the three deaths he quotes were all caused by neglect of the commonest precautions, he would have done far better service than by entering into a quasi-scientific disquisition which the general public cannot understand, and which is so full of absurdities as to show that he has either the little knowledge which is so dangerous a thing, or a deliberate attempt to make a good case by false inferences. The one point plain in this article is that the system of one particular company is perfectly safe and the systems of all others are dangerous, and that one in particular should be wiped out of existence. One of the deaths which Mr. Brown cites, that of Mr. Witte, was reported as caused by a "closed circuit" "shunt wound" machine, the very one which he calls the "steady current," which "has only four victims against the scores killed and maimed by the pulsating current," the fact being that the "pulsating current" has tens of thousands of arc lamps where his much boasted "steady current" has thousands. It is as though he had claimed that only four men had been killed while travelling on horseback in New York City, while scores had been killed on the Elevated Roads—therefore it is safer to ride horseback than by railroad.

I have been running electric lights, both arc and incandescent, for the past seven years, and have never known of a case where it was conclusively proved that a man was killed by the electric current without there having been gross carelessness in some direction. Mr. Brown could very easily account for every death that has occurred in New York (as far as I have been able to follow them) by the condition of the wires alone. Any man who would undertake to run belts carrying thousands of horse-power, even in a factory where none but skilled help are employed, in the unprotected way in which wires are run overhead in New York City, would be universally condemned. I never walk in the streets of New York but my blood boils to see the criminally dangerous and reckless manner in which wires are strung through the streets. They are placed not on poles, but mere stumps, and wood exposed to the weather seems to be a good enough insulator. The so-called underwriters' covering seems to have been originally the standard, and even that is worn off in many places for several feet along the wires, while the whole air is full of dead and rotten telegraph, telephone, burglar alarm, and district call wires, any one of which by falling across an arc light circuit becomes itself as dangerous. It is absurdity for Mr. Brown to talk about lighting stations and "simple rules and precautions" to be enforced therein. No precautions at the stations, however valuable they may be, can render electric lighting safe when the outside circuits are in this condition.

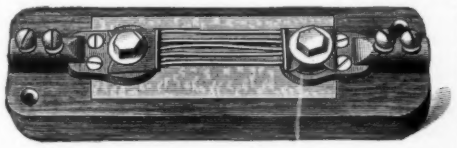
It is this outrageous and inexcusable carelessness which has led to the cry of "underground wires," a cry which has so much real foundation that we may well excuse the often rabid insistence of its utterers. The fact that the wires are in this condition in the largest city in the country is taken as proof that they are in a similar condition in every city and cannot be made safe, and paper after paper reiterates the senseless shriek against the horrible danger of overhead conductors, without any reference to the manner in which they may be installed. An overhead wire with properly soldered joints and waterproof insulation, with insulated tie wires and kept clear from all ground contacts on buildings or trees, and out of reach from the ground, is as safe as any underground conductor that can be made, except in case of damage caused by fire, storms or external violence, in which cases the underground conductor has such an overwhelming advantage that this plea alone should be sufficient to cause them to go underground.

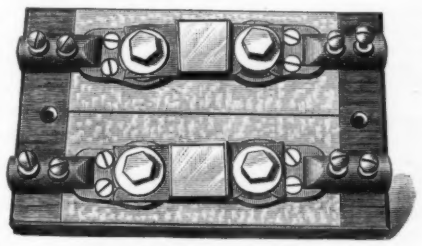
I am an earnest advocate of underground wires, and an interested one, but the claim that wires are dangerous simply because they are overhead, will only hurt the cause, for that reduces it to the level of the outcry against the introduction of railroads, or gas, or any new improvement. There are enough fair arguments against overhead wires without resorting to claptrap or trickery.

If Mr. Brown kept himself posted, as any one who wishes to pose as a general electrical teacher should certainly do, he might have noticed a report in one of the electrical papers of a painter who fell from the roof of a building in Pittsburgh, and who saved his life by catching hold of the two opposite leads of an overhead circuit, carrying 1,000 volts of alternating current, by which he hung until taken down unhurt by a ladder. This is what I call good practice in overhead construction. High insulation and such solid work that your wires can stand the strain of a man falling 20 feet on to them without tearing them loose.

Now for Mr. Brown's attack, on which he has been pleased to call the "damnable alternating current." He evidently has not had the least experience with the alternating current as applied to electric lighting, and his information, which seemed to have been derived chiefly from a gratuitously circulated publication of the corporation the sale of whose particular apparatus is most affected by the alternating system.

In spite of all that has been said on this subject in the last year at the various electrical conventions, in spite of the published descriptions of the various converters manufactured by different companies, without taking the trouble to inform himself by actual inspection of a single one converter, he again repeats the statement, which I can characterize as nothing but the grossest ignorance of electrical manufacture, or a deliberate falsehood, that between the two circuits in a converter "is interposed nothing more than a thin layer of cotton or silk insulation," and he says that "as has happened again and again, it requires but a flash of lightning or a little moisture in the converting apparatus to bring the 'death current' to each lamp," showing his utter ignorance of the whole subject, not to know that in the first place, the lamps of one group would be affected, and they would only be affected by being extinguished, for in such cases the safety fuses would immediately melt and cut off the current. A more contemptible evasion of the real question at issue I have never seen than his reference to Messrs. Siemens & Halske, as opponents of the alternating current. Messrs. Siemens & Halske abandoned the manufacture of alternating apparatus for the same reason that Westinghouse abandoned their apparatus after having tried it, namely, because they could not make commercially





FIGS. 1 AND 2.

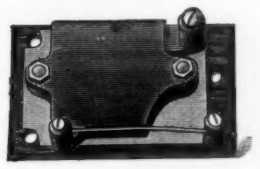


FIG. 3.

Now, the fact is that it has been proved in a dozen cases that the alternating current, while more disagreeable, is less dangerous to life than a direct current of the same tension. Personally, I have received the full 1,000 volt current from an alternating current machine, not once, but a half dozen times, and I have received the direct current in the same way, and, while the direct current will always make one sick for some time after the shock, the alternating current leaves no such effects. I have seen five or six men get this 1,000 volt alternating current shock direct from the machines. I have pulled one off who was hanging to the bare switchboard wires and whose hands were badly burned, but who in half an hour was at work again, having in the meantime walked by himself to a doctor to have his

England, is usually referred to as one of the best posted men and the most thoroughly disinterested electrician of the day, and I myself heard him say at the Electric Light Convention held last February at Pittsburgh that the alternating system as installed in America made him feel that we were far ahead of anything they had done in England, and that he had completely changed his opinion, and was now satisfied that the alternating system was safer than any direct currrent of the same tension could be. For people who have had absolutely no experience with electric lighting by alternating currents to refer to speeches made five years ago by electricians, however eminent, is folly when we recall the history of the alternating system in this country. First it was an impossibility. Then this was limited to its being a commercial impossibility, and when its adoption showed that it was a success, every pettifogging self-styled electrician who had been engaged in proving it ridiculous turned his attention to proving that it was old, and that everybody knew about it years ago, and the very companies who had been ridiculing it, both publicly and privately, turned their attention to foisting on the public the most unblushing and slavish imitations of the successful form of this apparatus which is meeting with such success in this country, and which has excited the unqualified admiration of European electricians.

current." I presume he means the same Board whose Inspector read a paper before the Chicago Electric Club, in which he showed the induced charge from a single magnet as an instance of an alternating current. They will simply have to abandon this position. Would it not be a great deal more sensible to follow the example of the Philadelphia Board, which has simply placed the very strictest regulations (and what is a different thing, enforces them), as to the use of not merely alternating current apparatus, but of all apparatus, and came to this conclusion after a thorough inspection and test of the insulation and general construction of the alternating current converters.

When Mr. Brown styles himself "An Electrical Engineer," he lays himself open to the pertinent inquiry, What has been his experience? What work has he done to which he can point with pride as a specimen of careful work? Is not this the same Mr. Brown, of the "Brown Converter," who endeavored strenuously for two or three years to convince the various arc light companies of the country that it would be of great benefit to the public at large and to their dividends (for which he now expresses such a lordly contempt), to carry a 3,000 volt current for incandescent lighting into houses and stores by means of an apparatus of his own devising, and which was designed to occupy the very field now taken by the alternating current system? It is curious that he should apply to the alternating current system the very expression which was applied to it by one of the salesmen who was trying to induce me to adopt the Brown converter for house lighting on arc circuits, that this "damnable alternating current system" was just "wiping out apparatus" like theirs "all over the country." Can it be possible that a distinguished electrical engineer, like Mr. Brown, could allow himself to be swayed by any such trifle as this? Let us trust not. Very respectfully,

T. CARPENTER SMITH.

MR. SLATTERY'S PAPER.

FORT WAYNE, IND., June 29, 1888.

The Honorable Board of Electrical Control, New York City, N. Y.

GENTLEMEN:—The question of the danger of alternating currents in the present systems of lighting by incandescent lamps has been in the past a much discussed one, both at the meetings of the National Electric Light Association, as well as at the meetings of various scientific societies throughout the country, and the conclusions arrived at by those who are theoretically and practically competent to judge are, that the alternating current is not dangerous by any means when used within certain limits of pressure, and that the safety limit approximates 1,100 volts electro-motive force. After an extended practical experience of three years by those who have carefully followed the alternating systems in use, and after many physiologi-

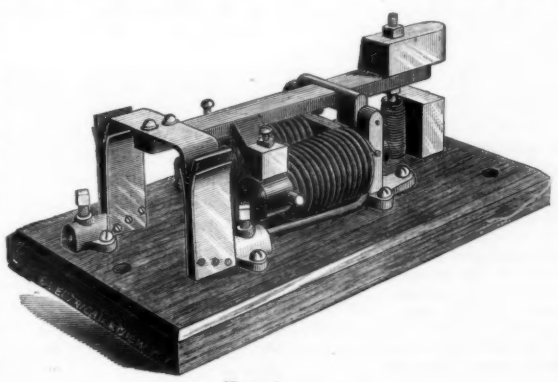


FIG. 4.

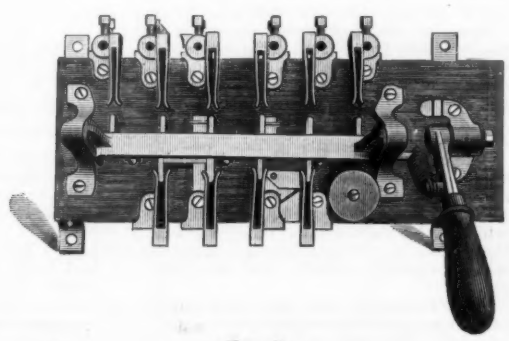


FIG. 5.

THE ELECTRO-DYNAMIC COMPANY'S STORAGE BATTERY APPARATUS—SEE PAGE 10.

efficient apparatus which would not overheat and burn up, and the fact is that Siemens & Halske are to-day making and selling the underground cables for alternating current work in Europe. These cables have one conductor in the center, surrounded by an insulating material; the other conductor is on the outside of this, with a second layer of insulating material, and the whole is covered with a sheathing of steel tape, and Messrs. Siemens & Halske recommend and guarantee these cables for use with an alternating current of 5,000 volts.

He says that he does not know of a single disinterested electrician of high standing who does not condemn the alternating current system. His acquaintance with eminent electricians must be limited. Why did the Edison Company secure the control of the Zipernowski system as soon the Westinghouse had made a market for the alternating current in this country? Why did the United States Company secure the Jablockoff system for the same purpose? Are not Farranti, E. J. Houston, Elihu Thompson men of high standing? Truly these men are all interested, but who are disinterested electricians nowadays? Frof. Forbes, of

burns dressed. Add to this that this high tension current is thoroughly insulated and protected from the house circuits by layer after layer of insulating tape, mica, fibre, and by an open air space, and one can easily see that the danger of high tension reaching the house is very remote indeed.

Mr. Brown has chosen to exhibit his ignorance and bias by speaking of lightning bringing the high tension into the house; that is to say, the lightning to enter any one house by the alternating current wires has to break down the whole insulation of the converter, while the direct metallic connection on the system which Mr. Brown is pleased to favor, brings the lightning itself with its tens of thousands of volts, direct to every lamp on the system without the slightest check or hindrance. Yet how many people have been killed by lightning coming to such wires? No one that I have ever heard of, and Mr. Brown knows that this danger is infinitesimal, or he is merely truckling to the prejudice in favor of direct current systems when he makes any such statement.

He spoke of the Chicago Board having forbidden the use of the "fatal alternating cal experiments, frequently involuntary ones, to determine the safe limit of pressure to work with, it has been found that no fatality can occur or serious inconvenience result from a shock from an alternating current having a pressure of that already cited, 1,100 volts. It has been long and well known that in most cases where fatal accidents have happened with high-tension continuous current systems, the death shock is received at the moment of breaking away from the circuit, not at the moment of completing the circuit around the body; the reason is obvious and two-fold, viz: when you place yourself in a circuit in which there is a flowing current at a dangerous pressure, the skin of the body, which has a very poor conductivity, in fact has good insulating properties, partly protects you from the danger shock; but as you will involuntarily make a desperate attempt to throw yourself out of circuit and succeed, at the moment of breaking away, an arc will be set up, burning the body insulation (the skin) and freely entering the trunk, cause paralysis of the respiratory organs, preventing thereby the blood from being oxydized; death will then ensue unless instant remedies be applied, and right in the

latter line recently in France the passage of an alternating current through a body has been found very efficacious in restoring life. The other reason of the fatality referred to is, at the moment of breaking circuit, an electro-motive force far higher than was normally in the circuit, is developed, considerably aggravating the effect of the shock.

In an alternating current of the same dangerous pressure there will always be a much better chance of escaping a fatality than in the case just quoted, as in the first place, the electrical impulses being equal and opposite, the effect of the normal electro-motive force alone will be experienced, for at the moment of breaking away from the circuit, when the pressure would have a tendency to rise, an impulse in the opposite direction will instantly neutralize it, and the E. M. F. is maintained normal; again, the very nature of the current, with the impulses equal and opposite, also tends to suppress the arc at the moment of breaking, for the self-same reason as that which tends to maintain the E. M. F. normal, preventing the skin from being so badly burned, and the current proportionately from free and dangerous passage to the vital organs.

The danger attending the use of converters has been frequently referred to, chiefly, however, by those not familiar with their construction. We will admit for the sake of argument that we have exceeded the safe limit of pressure in the converter, and let us see whether the dangerous current will or will not reach the users of the incandescent lamps.

I will premise what I shall say upon this point by stating, and I have had occasion to say elsewhere, that two-thirds of a difficulty is overcome when you understand its nature. Now, in this case we want to prevent the dangerous current reaching the users of lamps; we know the current is dangerous; our practical experience has so informed us. The secondary coil in the circuit of which the incandescent lamps are placed is in the same iron receptacle as the dangerous primary coil, which is connected with the primary circuit, and by the entrance of moisture or a discharge of lightning the organic insulation between the two coils might very readily give way, as it occasionally did in the early experimental stages of the work years ago; we should not, however, trust to any insulation to keep the current in the respective coils; in this case we simply introduce a conducting strip of copper or other metal between the primary and secondary coils in the box containing the converter, this strip being carefully insulated from both primary and secondary coils, as may be seen in the converter submitted for inspection.

Now, what is the effect of the dangerous primary current endeavoring to reach the secondary coil and circuit? It will be obvious that it will be intercepted by the interposed metallic strip referred to, and the current which might enter the secondary is diverted to a ground connection made with this strip. Should a lightning discharge enter the primary it will surely go to ground, for which it has in all cases an affinity seeking the passage of lowest resistance. Should a lightning discharge strike the house and the secondary circuit and make an attempt to get out on the line through the primary, again it is intercepted by the metallic strip and the integrity of the insulation between the primary and secondary is maintained, no harm happening.

These precautions have been dictated by experience in the use of alternating currents and induction apparatus, and I may be forgiven when I say that any other difficulty which may present itself as time rolls on and the alternating systems develop in magnitude will be equally, carefully, and successfully met.

As an instance of the unmeaning glibness of the speech of some of those who desire to constitute themselves authority upon the subject, but who have never qualified in any practical form, speaking of the dangers attending the use of alternating currents in the New York *Evening Post* of June 5th, a gentleman states that the danger attending the use of alternating currents will not be decreased, but, contrarily, will be greatly increased by placing the conductors underground. It is evident that the gentleman has concluded that because with the underground low tension continuous system great difficulty has been experienced in properly insulating to prevent troublesome grounds and disastrous leakages, that all other systems must, as a matter of course, suffer similarly. In point of fact, the low tension current at 220 volts in underground conductors offers a far greater strain upon insulation than the high tension alternating current at 1,100 volts. It will be known that one of the functions of a current flowing through a conductor is a heating one, that the greater the current transmitted through a given conductor the greater the heat, or, in other words, the heat developed is as the current squared into the resistance, $C^2 \times R$. It will further be known that with slow radiation, as must necessarily be the case with the conductors underground, the heating effect with a given current and cross section of wire must be enormously increased. With low tension continuous current system it frequently happens during the hours of heaviest lightning that a loss of some 20 to 25 per cent. is incurred in the conductors, and any person familiar with the temperature that a conductor attains at such a loss as this will not wonder at the troubles of the low tension system and the consequent strain upon the insulation. On the other hand, with the alternating current no such loss in the conductors need ever be permitted, and throughout hours of use may therefore be comparatively cool, certainly never warm enough to prejudicially affect the insulation. The reason of being able to work at a low temperature in the latter case of course is that working with a current alternating in polarity, small in quantity and high in tension, we can afford to work at a much less waste of energy and corresponding reduction of temperature in the conductors; therefore, the insulation of the wires in the latter case need never be strained, the strain on the insulation by the use of the higher E. M. F. being more apparent than real. These conclusions have been arrived at by careful practical experiments that no amount of sophistical theorizing can refute and are equally within the scope of all who wish to familiarize themselves with a few elementary facts.

By the use of the alternating current as now employed by companies long in the field, who have a reputation at stake, the electrical engineer has placed in his hands an electrical lever, so to speak, with which he may move the world, practically the greatest of all electrical developments of the age, of incalculable value and far-reaching possibilities, and any objections to its use (and their name will be legion) by interested persons, should be regarded and dealt with carefully and impartially, as affecting something of immense present public value as well as something of future public value, that at present it is impossible to overestimate, and should not be too hastily condemned in consequence of the utterances of the inexperienced.

Yours very truly,
MARMADUKE M. M. SLATTERY.

Magnetism in Watches.

BY OSCAR ERICSSON.

I recently read an article on "Magnetism in Watches," by C. K. Giles. If the article is published as an advertisement for Mr. Giles' anti-magnetic shield cases, it is very good; but if it is written in the interest of science, criticism will not be out of place, as the article seems exaggerated in several respects; at least the protection afforded by the shield is greatly overdrawn.

Mr. Giles demonstrates that a balance wheel, as generally made, *i. e.*, a steel and brass compensated balance, is virtually a compass needle. I have tested a number of such balances, and find that in the majority of cases such is the fact. Of course, the traces of magnetism in a carefully made balance are very slight, so that it becomes difficult to determine to what extent this cause alone will affect a watch exposed to no other magnetic influence except what the earth has on the compass needle, or, in this case, the balance wheel of the watch.

But I believe it is safe to assume that the effect will be directly proportional to the strength of the magnetism in the balance wheel. Then let us replace the balance wheel with a bar of steel strongly magnetized. Now let us put the watch in a shield case and let it run, say 24 hours, in a certain position, and note its rate. Then let us change its position, and let it run another 24 hours. Now if the "rate" will be the same with the watch placed in a different position, it follows that the shield is an absolute protection against magnetic influence.

If, on the contrary, the "rate" varies with the different positions of the watch, as you will find it does, then the shield is not efficient, or at least, is only a partial protection.

Another test less troublesome to make is this: Take a shield case and place a compass instead of a watch within it, and move a magnet around the shield and you will see the needle respond to the motion of the magnet.

I have experimented considerably with the shield case, and every experiment has led to the conclusion that no watch whose escapement, balance wheel or hair spring is made of magnetic metal, can be depended on when exposed in the pockets of persons having business around powerful continuous current dynamos.

What degree of perfection has been attained in watches made of non-magnetic metal I am not prepared to state at present. But I have decided to discard the shield and begin observation and experiment with a non-magnetic watch, and if I find my observations sufficiently interesting, I shall touch on the subject again.

Appliances for Storage Batteries.

We illustrated, last week, several forms of electrical apparatus brought out by the Electro Dynamic Company, of Philadelphia, for use in the proper handling of storage batteries. This company has done a great deal in this direction, and has overcome many of the difficulties that at first surrounded this branch of electrical work. In this issue, we present a few additional illustrations, and append the following descriptions:

Figs. 1 and 2 are two forms of safety fuses with mica protection under the lead fuses.

Fig. 3 is a form of lighting arrester adopted by this company for use in central station systems, in order to prevent a possible discharge from the house line into the charging line. This enables the lighting to pass to earth without affecting the dynamo, and if it should produce a short circuit of the battery, which might occur through having a previous ground on the other leg of the battery, the safety fuse shown is melted by the battery current and in this way both the dynamo and battery are protected. These instruments have been in use during the past year on one of the largest charging systems of the accumulator company, and have proved a very efficient protector.

Fig. 4 is a transfer switch, principally used in central station work for transferring a battery which has been charged from a charging circuit to the discharging circuit. In this way a dozen batteries which have been charged in series may be connected with a single discharging circuit in parallel.

Fig. 5 is the compound Edco switch. The central bars are connected to the last five cells of the battery, and the two tongues operating, one at either end of the bars, are connected respectively to the charging and discharging circuits. In this way any number of cells can be charging at a time, and a different number may be used for the discharge. The connections for this switch are all led out at the top to safety fuses, as shown.

—— The Western Electric Company is in receipt of an order by cable for an electric light plant for Sydney, Australia.

—— After very active competition, the contract for the incandescent light plant, to be installed in the Windsor Hotel, Filbert street, Philadelphia, has been given to Mr. Cole, agent of the Sawyer-Man Company. The outfit consists of a 400-light plant complete.

—— Messrs. Watson, Brown, Stauffer, Landis and Lahugh have been appointed a Council Committee in Allegheny to prepare plans and specifications for lighting the city by electricity. The Committee sent out to visit other cities, had reported in favor of this new illuminant, of course.

——The Western Electric Company has secured the contract for lighting the Exposition at Chicago this fall with 200 arc lights and a considerable number of incandescents; a feature of the electrical installment will be the furnishing of current to a considerable number of Baxter motors for furnishing power to exhibitors.

—— Thos. F. Kelly, owner and manager of the National Theatre, Philadelphia, has purchased from Messrs. Walker & Kepler, agents of the Edison Co. in Philadelphia, the plant for lighting his theatre with incandescent lights, and the Philadelphia agent of the American Electric Construction Co. has received Mr. Kelly's contracts for arc lights for the same theatre.

—— John R. Bennett, the patent attorney, corner Broadway and Park Place, New York City, is also president of the Consumers' Gas Light Co., of Danville, Pa. Mr. Bennett's gas company has received the contract from the city authorities of Danville for lighting the streets with arc lights. The Philadelphia agent of the American Electric Construction Co. has closed the contract with Mr. Bennett for two 50-arc light machines and 100 lamps of 2,000 candle power each. The plant is to be in operation September 1st next.

ELECTRIC LIGHT NEWS

—— Akron, Ohio, is to have an electric railway, a charter for it having been granted.

—— Electric light in cakes of ice is a novelty for the illumination of ballrooms abroad.

—— The Council of Milwaukee, Wis., have passed a bill for the lighting of Grand avenue.

—— The Merchants Electric Light Company, of New Haven, has been declared insolvent.

—— The Athens, Ga., Gas Light Co. are reported as contemplating erecting an electric light plant.

—— The Laclede Gas Light Company, of St. Louis, Mo., propose putting up a plant of electric lighting.

—— Horace Stokes has contracted for the electric light machinery to be put in his flint mills at Stafford, Md.

—— An electric light plant will shortly be established in Denver by the Electric Illuminating Company.

—— The Keene (N. H.) Gas and Electric Light Company intend adding an incandescent plant to their large gas works.

—— The Thomson-Houston Electric Light Company, represented by W. A. Robinson, have contracted to light the city of Brunswick, Ga.

—— Messrs. Lutcher & Moore have bought an Edison electric light plant to be erected in Orange, Texas, and want proposals for copper wire.

—— The Thomson-Houston company of Chicago, will install a 70-light arc and 1,000-light incandescent plant for the Pine Bluff Water and Light company, of Pine Bluff, Ark.

—— There are now about 9.64 miles of wire employed in the City of Washington for the public lighting of the streets. Of these about 5.2 miles are underground. These wires are entirely separate from those employed for other purposes. Although the experiment has not proved completely satisfactory the underground system will be continued.

—— The Rutland, Vt., Electric Light Company held its annual meeting July 13th, and elected the following officers: M. J. Francisco, president; C. E. Ross, treasurer, and I. H. Francisco, clerk. I. H. Francisco was also elected secretary of the company. The Executive Committee consists of M. J. Francisco, A. H. Abraham and H. W. Cheney. Messrs. M. J. Francisco, B. F. Pollard and H. O. Edson compose the Finance Committee.

—— The United Electric Light Company, of Springfield, Mass., is erecting a new station 110x115 feet, which will be built fireproof. Considerable increase will be made in dynamo capacity, which now consists of two 20-light Thomson-Houston arc machines, four 45-light divided arc machines of the same system, one Thomson-Houston motor generator, and three 650-light Westinghouse alternating dynamos. The new station will be ready by September.

—— The Committee on Electric Light of the City Council of Richmond, Va., held a meeting July 18th. M. B. Flynn was present about the proposition of the Virginia Electric Light and Power Company to illuminate the city by tower and arc lights. He explained the details of the proposition, and Mr. Cole, who was also present, told how the tower would be erected, and the points of location. He said the annual cost would be $66,000. The committee then decided to reconsider the adoption of the proposition.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 16, 1888.

386,103 Secondary electric clock movement; Carl Bohmeyer, Halle on the Saale, Prussia, Germany.

386,111 Electric wire insulator; Henry H. Cutler, Newton, Mass.

386,129 Automatic telegraph transmitter; Zeroy P. Hotchkiss, Oak Park, Ill., assignor of one-half to William W. Dudley, Washington, D. C., and Carlos J. Ward, Oak Park, Ill.

386,149 386,150 Galvanic battery; Abraham V. Meserole, New York, N. Y.

386,175 Police signal apparatus; John C. Wilson, Boston, Mass., assignor to the Municipal Signal Company, Portsmouth, N. H.

386,184 Electric railway; Robert A. Chesebrough, New York, N. Y.

386,189 Electrical bulletin; Patrick B. Delany, New York, N. Y.

386,225 Electrical distribution by storage batteries; George W. Walker, Bethlehem, Pa.

386,281 Method of blasting; Montgomery Waddell, New York, N. Y.

386,282 Tunnel construction for electric railways; Granville T. Woods, Cincinnati, Ohio, assignor to the Woods Electric Company, same place.

386,340 Dynamo electric machinery; Georges Miot, Paris, France.

386,380 Telephone transmitter; Charles W. Brown, Montreal, Quebec, Canada, assignor to the American Bell Telephone Company, Boston, Mass.

386,441 Apparatus for electric welding. Elihu Thomson, Lynn, assignor to the Thomson Electric Welding Company, Boston, Mass.

REISSUES.

10,944 and 10,945 Electrical conductor; Edward Weston, Newark, N. J.

Charles R. Vincent & Co.
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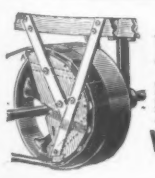
A. B. MOORE,
Chairman Lighting Committee,
ITHACA, N. Y.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THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

July 25th, 1888.

The Semi-Annual Meeting of the National Electric Light Association will be held at Hotel Brunswick, New York City, August 29, 30, 31. All communications relating to this Convention to be addressed to

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Chairman Executive Committee,
131 EAST 73d STREET, NEW YORK.

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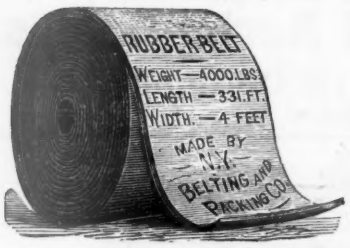

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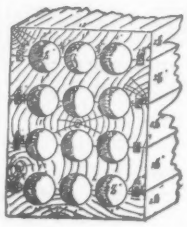

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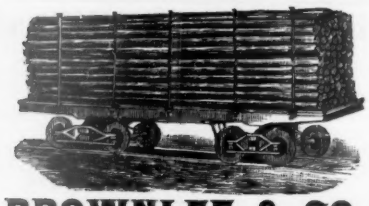

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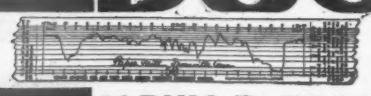

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